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TELEPHONE ENGINEER

Vol. V CHICAGO, APRIL, 1911 No. 4

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Telephone Engineer

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TABLE OF CONTENTS.

Editorial 185-188
Telephones at United States Forts. By Waldon Fawcett..... 189-191
Cumberland Company Wins Case 191
Effects of Physical Connection. By Theodore Gary..... 192-194
Telephone Exchange Directories. By Will M. Traer and J. E. Magley 195
New York Exchange to be World's Largest..... 196
Who's Who in the Telephone Game..... 197
Illinois Public Service Commission Act..... 198
Wisconsin Commission Makes Test Calls 198
The Telephone Scrap Book 199-202
A Telephone Crisis in Great Britain. By Herbert Laws Webb..... 203-205
Our Telephone Manners 205
Telephone Condensers and Their Uses 206-208
Equipment at Sidney, Ohio 209-210
New York Commission News 210
What One Woman Thinks. By Sarah Elizabeth Brown..... 211-212
Some Questions Answered. By J. C. Slippy..... 213
Public Relations in Telephone Service. By William Dunton Kerr..... 214-216
Wayside Service for Rochester..... 216
Digest of Foreign Telephone Literature 217-220
The Law and the Telephone. By E. J. Wenner..... 220-222
Recent Telephone Patents. By David S. Hulfish..... 223-224
Department of Railway Telephones 225-233
Of Interest to the Trade. By A. L. Haase..... 233-239
Brevities of the Business 239-244

PHYSICAL CONNECTION ENDORSED.

THEN the directors of the National Independent Telephone Association elected Manford Savage president the independent field experienced a general feeling of satisfaction. With J. B. Ware still in the secretary-treasurership, E. B. Fisher as first vice-president and N. G. Hunter as second vice-president, there is an assurance that the progressive policy of the past year will be continued.

Mr. Savage brings to the presidency of the association, first of all, a logical mind. Like his predecessor, Frank H. Woods, his profession is the law. In the present condition of affairs in the independent field, with the tendency toward commission control of public utilities; the constant menace of mergers and merger legislation; and the general desire to find a substitute for the expensive competitive warfare of the past many years, legal training is almost essential to efficient leadership.

"Sentiment," as a telephonic asset, lost its value long ago, and to allow it to influence in any way the actions of members of the association, individually or collectively, would be distinct retrogression. With men of sound business training and tried judgment at the helm, the independent are assured that their association's policies and activities will be practical.

Mr. Woods, in his administration, advanced the cause of practical independency tremendously. His advocacy of compulsory physical connection and commission control, while uttered in his personal rather than his executive capacity, unquestionably did much toward establishing the present policy of the association. It is sufficient to say that the present incumbent of the chair is heartily in accord with the views of his predecessor.

Suspicion has been especially rampant in the independent camp during the last few months, largely owing to the Bell-Morgan-independent conferences and the reticence of those who took part in them.

Such mistrust, it is true, savored rather of condemnation without trial, even without evidence; but in this the independents probably did not depart from the usual course of human nature. To allay these unjust suspicions and to convince the doubters of the integrity of the independent principle, President Savage, immediately followed his election, issued this statement:

As to the policy to be pursued by the National Association during the coming year: Personally the president has no policy. The board of directors passed a resolution fixing a monthly meeting of the board. As I understand it, these meetings will be in the nature of a round robin, where all matters affecting the independent telephone interests will be discussed and such action taken as seems wise to a majority of the board.

I may say the fixed purpose will be to maintain the integrity of the National Association, yielding none of the basic principles upon which it is founded; to extend the hand of fellowship to all honorably engaged in the independent telephone

business; to eliminate suspicion; to reject as unworthy all insinuations of bad faith on the part of those working to a common purpose, the good of all; and to invite the freest discussion of all matters affecting independent telephone men in the United States.

At the same directors' meeting of March 14, which placed Mr. Savage in the chair, a resolution was passed urging that those commissions regulating telephone utilities compel the interchange of service between different companies. This is the resolution:

Be It Resolved, by the Board of Directors of the National Independent Telephone Association that it is the sense of this board that in all laws proposed to be enacted in the several states for the regulation or control of the telephone business, a provision shall be made giving the commission having charge of such utilities, power and authority to compel the interchange of telephone service between different companies and to fix and establish the terms and conditions under which the same may be done.

Be It Further Resolved, That such laws shall contain a provision to the effect that any telephone company desiring to arrange for such interchange of business with any other telephone company shall have the right to compel interchange of business under terms and conditions to be fixed by such commission.

Be It Further Resolved, That in any such legislation, a provision shall be made which will give to any telephone company the power of eminent domain if necessary to the acquirement of such right.

Be It Further Resolved, That the Board of Directors of this association recommends to the Independent telephone interests in the several states the procurement of such legislation, and pledges the support of this association to such effort.

Be It Further Resolved, That the officers of this association are hereby directed to render all reasonable assistance in this behalf.

It is gratifying to TELEPHONE ENGINEER that the policy of physical connection which it has advocated so insistently for two years has been adopted by the National Association, and that that body now stands committed to the furtherance of such regulations as shall make such connection compulsory. As we have said before, there is nothing new about interconnection of independent and Bell telephone lines; many such have been connected and in satisfactory relation for years. But TELEPHONE ENGINEER was the first to publish the fact that physical connection is the only means through which independent telephony can reach its fullest development.

Then came Frank H. Woods' advocacy of interconnection, uttered "in his personal capacity," as he was careful to point out. It was not taken personally, however. When a man of the known integrity of Mr. Woods, who has proven himself level-headed in all transactions, espouses a cause he is certain to have followers. In this case the belief in interconnection already existed in the minds of a majority of the really important independents. It was bound to find expression somewhere, and Mr. Woods proved to be the vehicle.

A little later Theodore Gary brought forth a paper entitled "Compulsory Intercommunication." This paper, far from being new, had been prepared by Mr. Gary when he was president of the association, but was suppressed by request of the board of directors at that time. When Mr. Woods sanctioned the publication of his views, Mr. Gary, heartily in sympathy with them, proved that with him at least, the thought was not new.

In spite of the efforts of these two strong independent leaders, the National Convention in February could not bring itself to official recognition of physical connection. President Woods' address, quoted in these pages last month, was confined largely to the subject; Mr. Gary's address, abstracted in this number, treated of nothing else. Yet the convention passed its memorable resolution recommending commission control—a condition certain to result in compulsory connection—and ignored the latter issue. Therefore, we repeat, it is peculiarly gratifying to us, as pioneer supporters of the measure, that the board of directors of the National Independent Telephone association has rectified the omission of the convention's committee on resolutions.

In view of the still unsettled conditions in the independent field, it is well that the association directors have decided to meet regularly on the second Tuesday of each month. Events are apt to move rapidly during the coming year, and frequent discussion will tend to keep the atmosphere clear. The only change in the directorate is the succession of Gen. A. A. Goddard, from Topeka, Kansas, to the place of F. N. Kondolf, from Rochester, New York, who resigned.

ENGLAND'S TELEPHONE PROBLEM.

A CRISIS in English telephone affairs is now coming to a head. At the end of 1911 the state license under which existing telephone companies have been operating will expire, and the government proposes to take over the entire service and run it as a public institution under the Post Office department. This is a gigantic enterprise, and preparations for it have already begun. It will involve, among other things, the addition of more than 18,000 persons to the list of civil servants.

In view of the more or less conspicuous failure which the Post Office has experienced in its operation of the telegraph system of the United Kingdom, there are many prominent authorities who view this latest experiment in state operation with disapprobation and alarm. It is believed that the government has demonstrated by past performances its unfitness for any such undertaking. The holders of this opinion advocate an adoption of the American plan of private ownership, as being far more conducive to efficient and profitable service. There is, on the other hand, a large body of public opinion which is opposed to private ownership, preferring public monopoly to private monopoly. The problem seems to require a solution which will meet both these views.

Herbert Laws Webb, a prominent telephone expert of England, has proposed a plan which seems to offer satisfaction to both sides. He advocates the creation of a corporate body which would take over all existing telephone systems, and would operate and develop the telephone service of the whole country on commercial lines. Mr. Webb gives this body a tentative appellation, the "Telephone Authority." Under present conditions of the telephone business in England, four-fifths of the local service is conducted by the National Telephone Company, the Post Office owning the trunk lines and portions of some of the local systems. And there are two systems owned by municipalities. The Telephone Authority would take over not only the plant of the National Company, but also the lines owned by the Post Office and by the two municipalities. The whole system would then be consolidated and operated by one organization, which would have for its single object the development and improvement of the telephone service of the whole country.

The financial operation involved would be of considerable magnitude, but, acording to Mr. Webb, pre-

sents no insuperable difficulties. The difficulties, whatever they may be, "are nothing compared with the advantages of placing the whole telephone business under a single Telephone Authority which would be a commercial body and would readily obtain the continuous flow of new capital necessary for the rapid development of the telephone service throughout the country." "If operated under commercial conditions, giving continuously improving facilities to the public at reasonable rates, and economically administered, it is certain to be productive, and consequently there will be no difficulty in obtaining the continuous supply of capital necessary for wide development." Mr. Webb everywhere lays great emphasis on the need for a vast amount of capital which is necessary to put the telephone service of England on an up-to-date and efficient basis. Under state ownership he believes that the requisite capital would never be forthcoming, for the reason that the financial control would be vested in the Treasury and not in those persons directly responsible for the conduct of the business; Treasury control of public money must in its nature be narrow and rigorous, and cannot be stimulated by the commercial considerations which are of the first importance in dealing with a rapidly expanding enterprise.

The Telephone Authority proposed by Mr. Webb would be conducted by a Board of Management, on which, besides the stockholders, the Post Office, the Treasury, the Municipalities, and the Chambers of Commerce would be represented. "The Post Office and the Treasury would be entitled to a voice in the management as representing the government, because, presumably, the Telephone Authority would continue to be a licensee of the Post Office, and would pay the Post Office a royalty, which would in time, no doubt, more than fill up the annual telegraph deficit." "The Municipalities and the Chambers of Commerce should be represented on the Board, in order that those bodies may be properly advised as to the real merits and difficulties of the telephone business." Such a broad representation would give, besides the commercial and financial control which is so essential, "the requisite measure of public control to safeguard the interests of the government and the interests of the general public with regard to efficiency, sound development, and reasonable rates."

It would seem that Mr. Webb's proposed Telephone Authority is a happy compromise, eliminating the objectionable features of public and private ownership and retaining the advantages of both. Though more admirable in a Utopian sense, it is in effect not so different from the practice which has gradually evolved in America—that of private ownership supervised and regulated by state commissions. The course of public monopoly in England and of private monopoly in America has proven that neither is desirable in the absolute. Placing the administrative power with more than one set of interests seems to be the ideal arrangement, thereby creating a balance of forces which keeps progress moving along the line of least resistance.

ILLINOIS COMMISSION BILL.

ON another page we publish a description of the Illinois Public Service Commission Act now in the state senate. This bill has several interesting and desirable points, the more salient of which are the following:

1. A single commission regulating or having jurisdiction over the whole state will be more economical and effective than two commissions.

2. A single commission will not have its jurisdiction divided in any case by geographical boundaries within the state, as would happen if there were two commissions, as proposed by some of the other bills.

3. A single commission representing the state at large will be subject in the least possible degree to any local political influences.

4. A single commission will administer the law consistently with the interests of the state as a whole, without discrimination for or against any locality or communities.

5. A single commission will have the benefit of the broad experience gained in dealing with public utilities all over the state.

6. A single commission having jurisdiction over public utilities, common carriers and railroads is preferable to the plan of two or more commissions for the reason that some of the smaller public utilities are engaged in furnishing various kinds of service, such as electric light and street railway or electric light, power and interurban railway service, and to some extent the plants are used in common.

CUTTING PRICES.

WE can conceive of nothing more incongruous with good business management than the act of a comparatively small manufacturer in cutting his prices below the point of any possible profit, just to take orders from a big competitor. In a price-cutting campaign the big manufacturer must inevitably win out in the end, and the little fellow gains nothing because he starts the trouble. He merely invites a retaliation that is apt to cripple him seriously.

We know of a case, of recent date, wherein the bids on a job ranged from $500 to $750, or thereabouts—a difference from low to high of fifty per cent. It is said a fair cost estimate on this job would have been $600. Where, then, does the $500 man get off?

The operator is interested in price-cutting campaigns, especially if he is in the market for equipment. He seldom or never sees their demoralizing effect on trade conditions. The manufacturer who puts the most money into making apparatus, and consequently has a first-class product, suffers most when prices are cut.

Cutting prices below profit is reprehensible, whoever starts it. But while with the big manufacturer it may be commercially immoral, with the little fellow it is merely foolish to the point of insanity.

THE PASSING OF THE RAILWAY TELEGRAPH.

OF course any innovation so radical as the substitution of the telephone for the telegraph in railroad train dispatching was certain to meet some antagonism. There are men in all walks of life who regard new practices and big changes with oriental suspicion, and prefer the line of least resistance as exemplified in following religiously the paths of their fathers.

All the complaints which may have been uttered against the train dispatching telephone we lay to these causes, because we prefer to believe they are at least sincere, if somewhat illogical. And because we do believe them sincere we give space to the following, which is quoted by the Wichita, Kansas, *Beacon*, from

a recent issue of a "railway men's magazine"—name not mentioned:

When the telephones were first put in the operators answered the bells promptly, as they did the telegraphic calls when then first learned to work on a telegraphic circuit, but now it takes as long to get the operators as it did by telegraphy; largely because the station men have to do work outside. When an operator's bell rings he has no way of knowing whether it is for orders or for some unimportant message. With the telegraphic call it could be distinguished readily by the distinctive signal.

The telegraph has another advantage: When an operator starts to repeat an order by telephone and has it wrong the dispatcher has no way to break him, but he keeps right on repeating it until he has finished, and then the dispatcher has to send the order again, which could be avoided with the telegraph.

When a dispatcher puts in a call by the selector and before the desired office answers another office gets busy, and when the man called finds the line in use he hangs up his receiver and goes about his work; on the telegraph circuit he could do this and still listen to the sounder.

After a dispatcher has called an office, and before finishing with the operator he is necessarily interrupted by another office, he cannot simply tell the first office to wait a minute, as by telegraph, but he loses him altogether and has to go through the calling operation again, as the operator cannot be expected to sit there when he has other work to do.

All telephone circuits are installed with a set of rules which protect the dispatcher from interference by others on the line. But the trouble creeps in and finally the superintendent or trainmaster finds that he can talk directly to some round house foreman or roadmaster and thinks the business of sufficient importance to interrupt the dispatcher's circuit, and this grows contagious.

It is true that orders can be repeated faster on a telephone, and it is not so much work to call on the telephone, but messages cannot be sent so fast as by telegraph. If a message is transmitted fast enough to convey the same sense in sentences, the operator cannot copy it, and the circuit remains idle between sentences, which allows others to get in and interrupt the service.

The efficiency of the telephone has decreased at least twenty per cent, due to the fact that the operators have grown back into the rut they were in with the telegraph. The telephone is superior to the telegraph where an operator goes to sleep on duty, but they are learning to cut out the bell when they wish to rest undisturbed.

The writer is well acquainted with two systems of telephones, and has worked both systems, but would welcome the telegraph again and would feel less tired than with the telephone.

With the telegraph a dispatcher could get up, step to the window or the water cooler and still listen to his work. Now, with the telephone, you are practically tied as with a halter to the desk for eight to nine hours.

We will not attempt to answer these statements here, because we have asked Mr. John A. Kick, electrical engineer for the Lake Shore & Michigan Southern Railway, to do so for us and his article appears in our Department of Railway Telephones on another page. Mr. Kick has explained very completely the advantages which the telephone shows over the telegraph, and these advantages are a matter of fact, not argument. Hardly a story of railway telephone installation, as told every month in our Department, but reveals some new and useful application which would be impossible with the telegraph.

The ubiquity and universality of the telephone, as compared to the extremely limited and restricted possibilities of the telegraph, furnish material for a hundred argumentative essays, were such support needed. The one fact alone that the telephone may be used by any employee of the railroad, and may be placed in every location where it could possibly be used by employees, brands the telegraph as obsolete. Even now railroads are installing telephones every two miles or so along their right-of-way; a procedure which bids fair to eliminate not only possibility of accident, but even chances of delay. Yet such a practice with the telegraph would be not only useless, but ridiculous.

The old Morse telegraph is dead, to all intents and purposes. The railroads, proverbially conservative, have adopted the telephone because it has been forced upon them by sheer merit. The innovation has led, logically, to others; and now we find a number of the big roads experimenting with wireless communication. Nor are these experiments purely tentative by any means. The adoption of wireless as an emergency means of communication from division to division is regarded as certain by many experienced railroad men. And these things mean the quick passing of the Morse telegraph. The only telegraphic system destined to live more than a few more years in the face of telephonic competition is some form of rapid printing telegraph, which may not even be a development of the key, the sounder and the Morse code.

A CONTEMPORARY RAILWAY DEPARTMENT.

WE note with interest that our contemporary, *Telephony*, has at last determined to start a "Department of Railway Telephones." For nearly a year and a half Telephone Engineer has been practically alone in this big field, and it will be a pleasure to have company along the way. We feel called upon to thank our contemporary for the real compliment to our foresight, even though it comes a little late. You know the old gag about the "sincerest flattery."

CHURCH PEWS AND TELEPHONES.

ANOTHER use of the telephone has been discovered by a progressive Milwaukee pastor. This minister's church attracts people from all parts of the city and often the ushers are in doubt as to whether certain pews will be available.

The minister wracked his brains for a long time and finally hit upon the idea of using the telephone. So he arranged with his congregation that when they do not expect to use their pews they will telephone on Saturday and thus the ushers will have a complete list of pews which can be used for the accommodation of non-members of the church.

The plan has worked admirably and the members of the church have responded so willingly that now the ushers have no trouble at all in finding seats for

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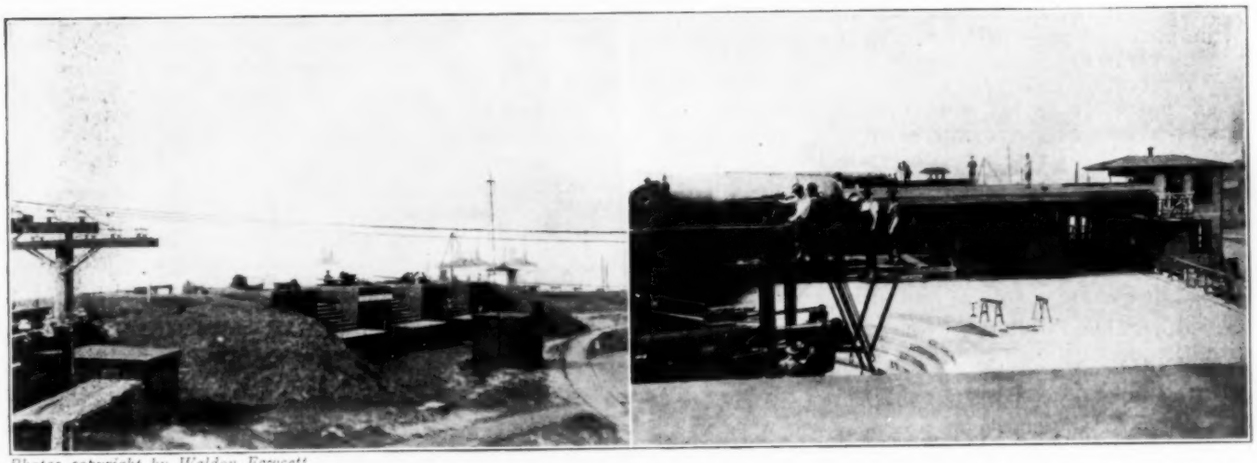
The *Cape Argus*, a South African publication, states that a remarkable development has taken place in the last year or so in telephone communication in South Africa. The number of applications has increased by 60 per cent in the last couple of years. Not only does the business man in the town realize its value, but the intelligent farmer is also finding that telephone communication puts money in his pocket. Individual farmers are beginning to ask for connections of their own, and a perfect network of telephones is spreading over the country. Since the establishment of the Union, very appreciable reductions have been made in the rates on the trunk lines. The reduction which took place last November has led to a very large increase in the number of calls, so that the department has had to put up extra wires in Paarl, Muizenberg and other places.



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Light Battery at a Modern American Coast Defense with a Glimpse of Wire Installation.

General View of Modern Coast Defense, Showing Two Heavy Guns, Fire Control Station, Etc.—Plotting Room and Telephone Station in Frame Building at Rear.

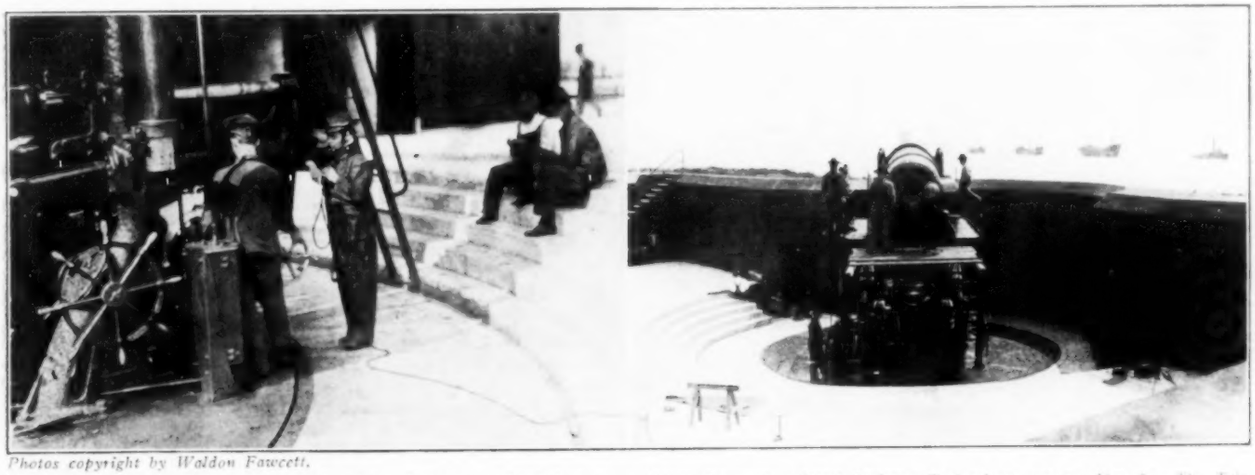
Telephones at United States Forts

By Waldon Fawcett

CONSTANTLY increasing dependence is being placed upon the telephone in almost every branch of the operations of the United States Army. Not only is there what might be termed the natural growth of telephonic installations of the regulation character—such extension being prescribed by the ever broadening sphere of military activities—but there is a distinct disposition on the part of the electrical communicative experts of our military service to carry on tests and experiments with the double purpose of improving military telephone facilities and discovering new spheres of usefulness for the telephone in time of peace as well as under war conditions.

The Signal Corps of the army, which is the branch of the military establishment having charge of the construction and maintenance of all military telephone and telegraph lines, has of late maintained in Washington a research laboratory which bids fair to make important contributions to the cause of knowledge and invention with reference to the telephone. The recent invention by Major Squier, assistant chief signal officer, of a new system of multiplex telephony is the first important outcome of the operations at this new research laboratory and presumably it constitutes merely a beginning, inasmuch as the Signal Corps experts are likewise experimenting with wireless telephony and other utilities that give promise of undisclosed possibilities. Furthermore the research laboratory, being located at the U. S. Bureau of Standards and having at its disposal the wonderful equipment of that unique scientific institution, is in a position to make especially valuable in results the tests of all manner of telephone supplies and equipment which have also been entered upon as a part of the new telephonic policy of the Signal Corps under the direction of General Allen.

Every fort or military post throughout the United States and her possessions may be described as a "nerve center" of telephone activities. The army installs and operates three general classes of telephone



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In the Gun Pit at a Modern Battery—Receiving Instructions by Telephone as to Elevation and Direction to be Given to the Big Guns to Attain the Desired Range.

Heavy Guns at a Coast Defense Trained on passing Vessels.—The Telephone Operator Is Standing at the Base of the Big Gun and Wire May be Seen on the Concrete Floor.

systems. First, there is what is generally referred to as the post system—that is a system enabling instantaneous communication between all parts of the military reservation embraced in an army post. This has an exchange located at some central point and is in substance very similar to the system which one might expect to find in a suburb or small town where the residents had the good judgment and the financial resources to demand the best of telephone service even though the number of houses and business places to be served be limited in number.

The second class of military telephone system is the one designed to carry all the confidential communications which must be transmitted in connection with the operations of one or more batteries forming a sea-coast defense. This is, in a measure, the most important and responsible form of service performed by the telephone in connection with military operations. Such a system which, of course, attains its maximum usefulness only under the conditions of real or mimic warfare or target practice, is presumably closely allied to the post system in its territory. Indeed the relation is much that sustained by the private branch exchange system at a large industrial plant, any one of the telephones of which can be connected at will with any outside station of the regular city service as given in the surrounding locality.

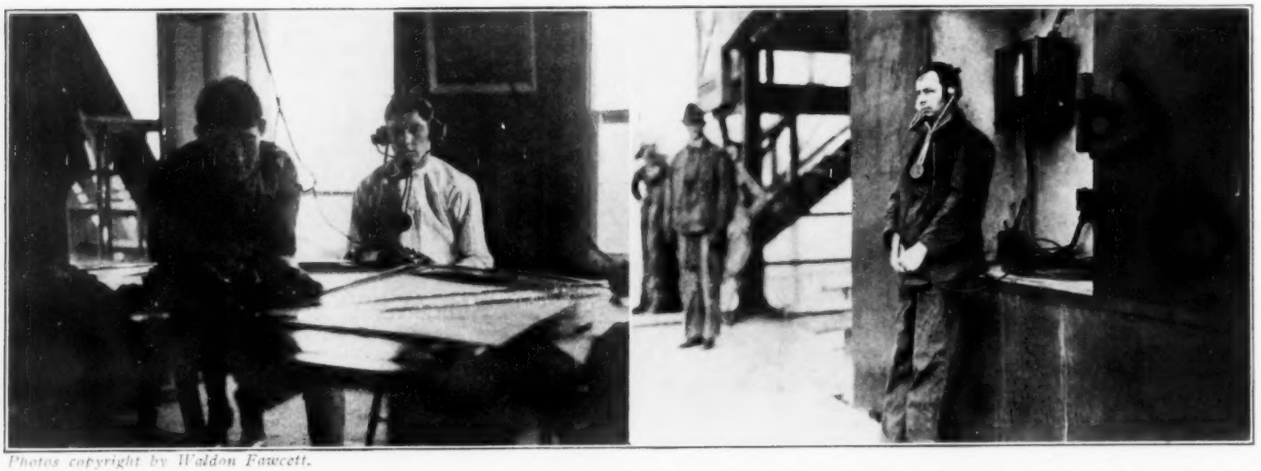
Photos copyright by Waldon Fawcett.

General James Allen, Chief Signal Officer, U. S. A.

The third class of telephone service exploited by the army is that designed to serve the needs of a body of troops in the field and presumably moving from place to place more or less rapidly under regular campaign conditions. This service involves on the one hand the responsibility for erecting, as rapidly as the military force advances, a telephone line that links the nomadic soldiery with the headquarters post or base of supplies, and on the other hand presupposes temporary local telephonic installations in the immediate locality where the force is operating. To what extent this latter has been carried may be surmised from the achievements of the Signal Corps in carrying on telephone conversations between men on galloping horses—troopers who have demonstrated their ability to pay out or reel in telephone wire while their mounts were charging forward at full speed.

From the standpoint of the telephone engineer engaged in the commercial field probably the most interesting of all army telephone installations are those at the coast artillery stations or sea-coast defenses. First of all is the consideration that such lines must be constructed with the greatest care and protected in every possible manner, for in time of war the greatest dependency would have to be placed upon them. Furthermore unusual precautions are necessary to nullify the effect of the vibrations caused by the discharge of the immense guns close at hand. And finally, measures must be taken to thwart the influence of dampness and mayhap, the stress of wind and wave, for many of these lines must of necessity be located in more or less exposed places on the seashore. Each individual battery in an artillery district must be connected with the office of the division commander and in the case of fortifications located on islands this necessitates, of course, the use of submarine cables. Incidentally, it may be noted that this is one of the fruitful fields awaiting wireless telephony.

The officer—presumably of the rank of colonel—in command of an artillery district and keeping an eye on the whole situation at the "battle command station" is in touch, by means of the above-mentioned network of wires, with the "fire command stations" in charge of officers of the rank of major, and through them with the officer in immediate charge of each



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Ascertaining by Mathematical Means the Proper Range for Coast Defense Guns and Transmitting the Findings to the Gun Stations.

U. S. Artilleryman Receiving Instructions from the Battle Command Station as to the Fire of His Battery.

battery in the fortification or artillery district. But not only is the telephone relied upon to transmit to each gun squad the general orders such as "Begin Firing," "Cease Firing," etc., but it is relied upon to carry what is even more essential—the information upon which the men behind the guns rely to enable them to hit the moving targets from one to five miles at sea.

As most of my readers are doubtless aware, it is no longer the custom to train the great disappearing guns of our coast defenses in the primitive way in which cannon were sighted and manipulated during the Civil War. All the modern big guns are loaded and trained out of sight of the enemy, behind walls of sand and concrete, the loaded gun when all is in readiness being elevated by mechanical means to a position above the ramparts, discharged by electrical impulse immediately upon attaining this position, and as quickly returned to its sheltered position to be reloaded and retrained in the event that the observations of the officers on the lookout indicate that the preceding shot was not as effective as desired.

All the training or aiming of the big guns is accomplished by mathematical means and telephone lines convey the information for the deductions. The securance of the data for these mathematical calculations is not left to the men at each battery, but is a responsibility which rests upon experts stationed in specially constructed and advantageously located observation towers, sufficiently lofty to enable their instruments to sweep the entire horizon. The "range-finding" system now in vogue requires two of these "position finding stations," known respectively as primary and secondary stations. The experts at the two stations, working in conjunction on the system of the azimuth, determine the exact location of a vessel or other target. This information is telephoned to the "plotting room," which occupies a small frame building in the rear of each battery.

At the plotting room the experts stationed here for the purpose compute the range for the particular battery to which they are attached and this information, in turn, is telephoned to the guns. There is some latitude as to the number of pieces of ordinance comprising a "battery," but in the case of the guns of the heaviest caliber employed in the coast defense a battery usually consists of two of the 12-inch or 14-inch guns. At each battery there is a telephone terminal in the form of what might perhaps be described as a wall cabinet of special design set into the concrete wall of the protective works at a central (and likewise a sheltered) location. However, the continual flow of conversation that comes from the plotting room during an engagement or target practice is destined not so much for this terminal as for one man in each gun squad who is delegated to receive such verbal bulletins, and who keeps position about the base of the big gun, but with a telephone cable of sufficient length trailing over the concrete floor to enable him to shift about as circumstances dictate. The telephone man in each gun pit has a head clamp receiver at his ear at all times and a transmitter in close proximity, and one of the men in the plotting room is similarly equipped, so that there is little chance of the slightest delay in the communication of the data for range finding or other data essential to the effective operation of the artillery.

Cumberland Company Wins Case

The Mississippi supreme court has upheld the contention of counsel for the Cumberland Telephone and Telegraph Company in what are known as the series of Booneville anti-trust suits against that corporation for alleged violation of the anti-trust laws of the state in making and putting into effect discriminatory or cut rates in restraint of competition. There were six of these suits before the court on appeal, the first of these styled Cumberland Telephone and Telegraph Company vs. the State, while in the five others the appellees were private citizens and individual litigants.

These suits, in effect, sought to recover on behalf of the state, through the attorney-general's department, represented by W. P. Schinault, special counsel, accrued penalties from the Cumberland, on the ground that they were engaged in rate-cutting for the purpose of breaking up the competition encountered through the organization and operation of local concerns. This was claimed to be in direct violation of the anti-trust law of 1906, and the state sought authority to recover penalties which could have aggregated a million and a half dollars, as the penalty under the statute ranges all the way from $200 per day for each day on which such discriminatory rates were in effect up to $5,000. The amount claimed in the bill was at the rate of $1,000 a day, and the period during which such discrimination was practiced was from October, 1906, to December, 1910, at which period the proceedings were begun.

The court, in effect, held that as the Cumberland Telephone Company is classified under the head of common carriers, and is, therefore, under the jurisdiction and supervision of the railroad commission, the question of rates, as are other questions affecting jurisdiction and control, lie with that body. There was nothing before the court to show that the alleged discriminatory rates were not sanctioned by the railroad commission, and clearly action could not lie under the anti-trust statutes. In view of this holding the main case, as were the individual suits, was reversed and remanded.

The attorney-general's department will look into the decision and it is just possible suggestion of error will be filed, but at the present time, Hon. J. B. Harris, chief counsel in Mississippi for the Cumberland, is quite content with his victory, and does not anticipate any change of front or interpretation of the case by the court.

Radio-Telephone in Trouble

The Radio-Telephone Company has been placed in the sheriff's hands. The company was launched in May, 1907, during the height of the wireless telegraph excitement, as a two million dollar corporation, to exploit Lee De Forest's wireless telephone. It was involved in much patent litigation, which went against it both in this country and England.

The company's furniture and apparatus are being sold at a sheriff's sale to satisfy the $1,286 claim of Col. Samuel E. Darby, once the company's counsel, and Louis Duncan's $949 claim. Deputy Sheriff McDonnell found the company's furniture and apparatus, the only tangible things which remain of it, in a warehouse.

Effects of Physical Connection

By Theodore Gary*

PHYSICAL connection began between the independents by contract and between independents and the Bell by that famous document called a sublicense agreement. This agreement, brought out about 1894, made this provision:

> For communications from said exchange to outside points, the second party shall observe and shall require its subscribers to observe such regulations as the first party (the Bell) may have made for the use of its lines, and shall charge the regular tolls of the first party for the time being, and it shall receive 10 per cent thereof, not exceeding ten cents for any one message.

It also provided that, before such connection could be made, the independent company should use Bell transmitters and receivers, for which it was required to pay from $1.50 a year to $6, as the case might be.

At that time there arose in the telephone business a condition which we, as independent operators, did not meet. We simply ignored it for the good reason that it was an entirely one-sided affair. What might have been worked out of it we do not know.

Later, in a traffic agreement entered into between the Bell company and an independent company, we find the evolution of this physical connection by contract. This is not a sublicense agreement; this is a contract. In 1904 you were permitted to connect your lines with the Bell on condition that you lease transmitters and receivers. In this case:

> Both parties hereto deem it of advantage to connect their respective telephone systems in order to provide their patrons increased telephone facilities.

In each case it says "the parties." In the old case it was how the first party "reserves the right," and the second party "shall." There is no provision in this contract that the independent shall use any Bell apparatus. The contract provides that, upon all business originating at that office, it is to receive 25 per cent, and that the total commission on any one message is increased to twenty-five cents. In addition to this the Bell company pays the long distance operators. This applies to all the local lines. On the long distance business, that is, the A. T. & T. business, it paid 15 per cent and limited the commission on any one message to twenty cents. Observe the evolution. Originally it was a license. Later it became a mutual contract.

Later, as the independents began to build lines, we found a way to make connections. I have the original Middleport contract, about which there has been so much litigation. In these contracts we undertook to provide exclusive connections between independent companies. There are many of these in existence. The contracts were drawn to run for ninety-nine years. They contained the usual provisions common to such agreements. In a company in which I am interested we have a contract of the same kind, which has gotten into the courts. This has the usual provision, as follows:

> Each party hereto grants a license to the other party to connect with the telephone exchange or system of the other party, through its switchboard at Carthage and Joplin and Granby, so that an interchange of business may at all times be carried on between said parties. Said connections to be made as soon as the lines are completed, it being understood and agreed that the lines of both parties hereto shall be so operated that service may be given from all lines owned, controlled or connected with the line or lines of either of the parties hereto over the lines of the other and its connections. And each party hereto agrees not to enter into any contract with any other person, firm or corporation whereby any of the rights, privileges or advantages herein acquired by either party may be impaired.

This contract has gotten into the state courts of Missouri, and the Court of Appeals, a division of the Supreme Court, decided that that clause was contrary to the anti-trust law of the state. We have brought another case to test the validity of this provision which is now pending before the Supreme Court of the state of Missouri.

In the case of the Ohio contracts the lower courts decided that the exclusive provisions were legal and should be upheld. One of the higher courts held that they were contrary to public policy and could not be enforced. The question as to whether this exclusive contract can be enforced or not is undecided at this time.

In Oklahoma it is a constitutional provision that telephone companies must make physical connection, and the Railroad Commission is given power to enforce that regulation. In Montana and South Dakota it is the law by statute and decision that physical connection between all companies can be enforced. Montana has a commission appointed by one of the courts, which is assessing damages in these cases. All of these forms of contracts have gotten into the courts.

We now have physical connection with the Bell to the extent of about 2,000,000 stations, not compulsory in all cases, not by statute law, but by that immutable law of supply and demand. I take it for granted that the man who is operating a telephone plant considers it as a local situation, treats the situation as such, and if he finds that the circumstances and conditions are such that he must connect his property with that of some other company, even if it be a competitor's, he does so. He complies with the demand which he cannot refuse.

I want to keep before you the fact that about 8,000 companies—2,000,000 stations—actually have today physical connection with the Bell by contractual relation, by law, by statute and decision, and by organic law of the state of Oklahoma. Having considered the things which exist, let us next take up the probabilities.

Judge Rose, of Nebraska, recently wrote a letter to the officers of the National Association, which bears directly on this situation. He said:

> It must be admitted that interchange of telephone services necessarily involves the use and employment by one company of the whole lines and equipment of another company. In this feature the regulation differentiates from the requirements for transfer requirements between railroads, which leave each railroad company in the exclusive charge and operation of trains over its own separate lines. But the difference noted is inherent in the various methods of operation of the two services. In the railway transportation the several consignments of individual shippers are

*From an address delivered before the fourteenth annual convention of the National Independent Telephone Association.

assembled together and carried by a single engine in a single train, and are adapted to ready physical transfer, either in parcel or carloads; and safety in train operations necessitates a single direction and control of the train movements on each line or system. So legislative regulations have simply made general and compulsory the system of transfers that were found practical and adopted by mutual arrangement under friendly traffic arrangements between connecting carriers.

This bears upon one point—that, if we make these physical connections by contract and we show that it is practical to make them, where such connections are required by statute the courts would probably sustain such provision.

What was practical in a friendly and discriminatory way and only under voluntary and favored traffic arrangements was coerced and made universal, by statute, to improve the public service. The limited and restricted adoption of the railroads of the same system proved its practicability and the public character of the service justified legislative adoption of the system in favor of those who had been previously discriminated against.

It is inherent in the telephone service, however, that each communication employs one whole line and the instruments at each end. Communication between any two points, however great their distance from each other, requires complete connection and exclusive use of the lines intervening. This physical requirement is inherent and unavoidable; but is not incident to railroad operation. Connection of two or more lines and use thereof during the communication is necessary in order to furnish any service to the public. So such connection and exclusive use of the line for the time being does not suspend the ability of either company to afford public service; it furthers the service and supplies it where otherwise the public service could not be afforded. It does not deprive either company of revenues because to obtain any revenue the company must surrender the use of its whole line for the time being to its patron. So, of necessity, long distance service can only be afforded to subscribers of different companies by physical metallic connection of their lines.

Telephone companies have adopted and employed and now employ the system of making connections with favored companies and exchanging business under favored and friendly traffic arrangements. They have themselves demonstrated both the practicability and necessity of employing this system of exchanging and extending business and thereby have improved the public service. But for this system we, at Omaha, could not talk to Chicago, as we do daily, between subscribers' stations of two separate companies. It is appropriate that the system already in use have legislative adoption, and the right of arbitrary and discriminating selection by each company if the companion with whom they connect be taken away and uniformity and universality of right of connection substituted.

This comes from a gentleman who has given a great deal of study and attention to the practicability and probability of enforcing physical connection.

This is the condition in which I find myself, and I believe you do, and the question first to consider at this time is: Is there a change of sentiment being brought about by the efficient work done by the Interstate Commerce Commission with the railroads? Is the public beginning to see a means of securing good service at reasonable rates by the creation of public utilities commissions? They have done a great work in other lines. Is the public beginning to look to them rather than to competition? And if it is, what shall we do about it?

Is there anything that we can do about it? That is the question. What is the best method of meeting these conditions? The administration has reported favoring regulated monopoly of public utilities. This has a tendency to reduce the demand for competition. The physical connection situation, by statutes of physical connection now and prospective, is a condition and not a theory. With 2,000,000 connections, with contracts in existence, with 8,000 telephone companies connected, we can not treat this matter in a theoretical way.

There is a condition before us that must be met. Whether we make money out of our business in the future depends on whether or not we solve the present situation rightly. We can settle it, provided we give it the attention that it deserves. I have a remedy I have been advocating for a good while. It strikes me that it is not a question of what will be the result. It is what is the method or basis on which we are to continue these connections. The question, then, is not, "Shall there be physical connection?" but, "What shall be the future method?" Shall it be continued, as now, by contractual relations, or shall such connections be made by statutory regulation and with all interests and not confined to the few?

As I look at it, compulsory physical connection makes every independent company absolutely independent of the Bell. It will not be necessary to depend on any contractual relations or any renewal, and the order of a commission compelling physical connection and providing how it shall be done can be as well enforced as a contract or any other arrangement entered into between men and companies.

Compulsory physical connection, in my opinion, is coming to the front. The Interstate Commerce Commission will probably have that power. It is going to come. We should prepare ourselves. We should prepare the standard equipment. We should prepare the rules and regulations and place them in the hands of these commissions for consideration, and we should have something to do with shaping how this matter is to be handled. It is right at hand. Twenty-two states already have commissions. The Interstate Commerce Commission now has a portion of the interstate telephone business under its control.

My idea is that it is destructive to independent interests and to the money invested in the independent business to make physical connections by contractual relations with the Bell. I think it has been a bad policy, a destructive policy, and that we ought to have arrived at it on a better basis or secured a contract with the Bell probably six or eight years ago, that one contract was to apply to all the interests alike through the country.

I have stood ready, and I have said time and time again to the Bell companies: "Yes, I will make a contract with you on one condition, and that is that it contains a provision that it is open to every one of my neighbors in this state or every other state."

That is all we have ever needed. That is all we need now, is the same rule to apply all over the land and to be made available to every company, if we are to have contracts, and if we are not to have contracts, then have the regulatory law.

I cannot tell you what is the best thing to do. I am not going to recommend what is the best thing to do. In the states in which we are operating we know what is the best thing to do, we think, and we are going to fight and work for physical connection laws. We are perfectly satisfied that it is the right thing to do and we are going to try to work it out on that line. Why? We do not want to make contracts with the Bell and we are not going to do it unless the plan contemplated is broad enough so that every one of the companies in this country can have the same privilege. There is nothing of that kind in sight just yet. It

strikes me that the public will think it is time to provide real universal service.

Here are the things that must be done before physical connection can be enforced:

In the first place, general powers must be given a commission, by proper legislative enactment, with enough specific authority to enable the commission to work out the details to meet the physical and electrical requirements in making practical physical connections between telephone lines and exchanges.

You cannot enforce such a law unless you have first created a commission, because there are too many details that must be worked out.

Provision must be made to allow an equitable distribution of the cost of supplying the apparatus and lines between the companies making such connection, when such existing lines or exchanges are operating lines or exchanges within reasonable reach of each other.

The commission must also be empowered to say what shall be the standard of apparatus and lines to be used in each particular case, and must proportion the expenses each of the companies making such connection shall bear. It must also give proper consideration to the displacement of any apparatus or parts made obsolete on account of such enforced connection. The commission must have the power to fix the rate.

There is a difference. If you are going to try to get any law, do not have a regulated rate; do not have a maximum and a minimum rate; but give the commission the authority to fix the rate. Do not forget that, because if we could fix the rate today that the Bell were compelled to charge and not give away their service, we would have the matter settled in many places. So we want the commission to have the power to fix the rate.

The law must require the sender of the message in all cases to designate the route or system over which he wishes to talk.

Providing heavy penalties against the company and the operator in case of any violation of this provision, or for discrimination of any nature.

The law must provide compensation for each part of the work performed by each company handling a connection, and this, too, must be an equitable distribution of the charge and must be an adequate compensation for the service performed.

There has no law ever been enforced in this country by confiscation of anybody's property. Neither can they confiscate your service to the interest of the public without giving you compensation.

The right of appeal by each company and by any customer concerned to the commission and the respective courts should be provided as specifically as possible.

In states where there is any conflict in authority in making such compulsory connection enforcible, on account of any such enforced connections being in violation of constitutional provisions in the taking of private property for public use, under the right of eminent domain, and without due process of law and adequate compensation, the refusal by any company to comply with the commission's orders to make such physical connections and exchange business upon the terms mentioned in the order should be covered by the action of the commission which should be brought within the purview of such provision and the damages fixed at so much per talk.

So far as I know, it is the law in all the states that the telephone or public service corporations, like railroads, have the right of eminent domain; that is, they can condemn the right of way through the country under due process of law. In some states it may be necessary that the commission be authorized to condemn this property under due process of law—in other words, condemn the right to put a line on the opposition switchboard and pay so much per message. I can not give you the technicalities, but they bring a proceeding called a condemnation proceeding and commissioners are appointed. They assess the damage and that sum of money is paid. They even go so far as to condemn right of way over the same tracks in cities, so that other companies may run their trains over the same tracks of opposition companies; and yet some people believe that we cannot make physical connection legal!

In states where connections are to be made under constitutional provision, such provision should be taken as a basis, and proper statute enacted providing for the safeguarding of the respective interests, and compensation for the use of existing property should be provided for, or for that part of the apparatus made obsolete by order of the commission and for expenditures made necessary to comply with the commission's orders, and a proper distribution of the cost made.

Finally, the whole attitude of the lawmaker and the commission should be that of providing fair and equitable means of making the connection in the interest of the public and a fair compensation for each class of service performed for each company, the charge being equitably distributed between all parties concerned in making such connections.

We would like to have those connections. We would like to have connections of that sort, just as many as we could get. Fair and equitable means for making the connection and a fair compensation. What more can we want? We are not asking for more than that.

We have not gone at it exactly right. Are we going to take up the question and handle it now? Are we going to take up the question of physical connection in a way that is not going to distress us, or are we going to allow it to go on as it has been and allow our independent companies to be disconnected and our system broken up? What are we going to do about it?

Commission Bill in Washington

A bill creating a commission of five to regulate railroads, street railways and other common carriers, gas and electric companies, telephone and telegraph companies, which was prepared by Representative Walker Moren, has been introduced in the Washington state assembly.

The proposed commission takes the place of the railroad commission. The members are appointed by the governor. It will have power over the character and the extent of the service and the dates; the right to inspect books, investigate accidents and hear complaints.

"It is not the purpose to make unwarranted and violent attacks upon corporations," declares Mr. Moren, "but to provide a general supervisory force to carry on the business on a fair commercial basis."

The commission will have offices at Seattle, Spokane and North Yakima.

Telephone Exchange Directories

By Will M. Traer and J. E. Magly

MAKE THE EXCHANGE DIRECTORY A REVENUE PRODUCER.

WHERE is there good business judgment and ambition displayed by the telephone company that issues its exchange directory from year to year without a line of advertising or a single feature that could enable it to pay part of its cost if not all? Only a small percentage of telephone directories issued in the medium sized and small towns in the United States carry advertising matter, and we believe it is generally due to the lack of ambition and energy on the part of some one. Of course, the manager may be loaded down with work, but surely there must be some one about the exchange who could, after a little instruction, go out and solicit local advertising.

Persistence will get it in almost any community. It doesn't require a great deal of time, so that part of the expense is small. It is generally not difficult in towns of 500 or more population to secure at least half enough advertising to pay the cost to the printer of issuing the directory. Any telephone exchange directory with a lot of good advertising properly placed reflects credit on the company and community. It indicates that they are both alive.

The source of revenue that may be derived from its directory by a telephone company is not confined entirely to display advertising. The plan of listing business subscribers in bold-faced type at from fifty cents to one dollar per listing, nets one Iowa company a goodly sum with each directory issue.

Another opportunity offers itself on the cover. Set aside a quarter or a third of the front cover page for the directory heading, which should include the name of the company, manager, town, date of issue, etc., and let the balance of the page be ruled so the subscriber may write in the names that he calls most often. Five or six spaces will generally accommodate the subscriber very nicely, leaving ample room to solicit listings on this page in bold-faced type from the butcher, baker, grocer, plumber and other lines of trade and merchandise at a good price per listing. One listing of this kind on the cover of a directory issue of 1,000 copies ought to sell readily at from $3 to $5. By all means the latter price, if it is exclusive.

Let us consider the case of a revenue producing directory. We will cite an instance that is founded on facts. The "A" telephone company in a town of 4,000 population has a subscription list in town and surrounding country of 2,000. This list set up in a medium size type occupies forty pages. Manager of the "A" Telephone Company instructs the local printer to make up a sixty-four page dummy for him of the same size that the directory will be made. With this dummy the manager or his bookkeeper spends a little spare time, now and then, soliciting advertising.

A rate is of course first made up which we will specify as $5 per page per thousand of circulation. In an issue of 2,000 directories this would be $10 per page.

The work of soliciting advertising should be commenced six weeks or two months ahead of the time for turning the directory copy over to the printer.

In this particular instance forty pages takes care of the subscribers' list and four pages will handle the inside title page, rules and instructions, ringing codes, etc. This leaves twenty inside pages and three pages on the cover for advertising. Based on the $10 rate for the inside pages, including the inside cover pages, the total amounts to $220. The outside back cover should bring at least $15. A spirited advertising soliciting campaign will sell the twenty-two pages at an average of at least $10 each, and the back outside cover page at $15, making a total of $235.

The front outside page, as above suggested, can be made to net at least $15, and at least forty business and professional firms can be secured for bold-faced listing inside the book at fifty cents each, bringing in an additional $20, making the total revenue $270.

The printing and binding complete of 2,000 copies of such a directory, with a very good grade of paper used for both inside and cover, including punching and stringing and marginal index, with the cover pages printed in two colors, should not cost to exceed over $225 or $250. We know of many instances where this has actually been carried out, netting the telephone company $25 to $50 on each issue.

We would be glad to hear from those different telephone companies that carry local advertising in their directories, especially those who have made the advertising more than pay for the cost of the directory issue.

To End "Rubbering" in New Hampshire

The village gossip, who, since the advent of the telephone in the rural districts, has abandoned the slats of the shutter to do her "rubbering" and scandal-garnering on the party wire, is due for her deserts if a movement launched in New Hampshire to make her mind her business or pay a fine becomes general. The progress of a bill introduced in the legislature of the Granite State is being watched with interest.

Herman A. Clark of Portsmouth, father of "the rubber-neck telephone bill," as it is popularly known, is in receipt of many indications of almost unanimous support for his measure. It provides that wilfully breaking in on a telephone conversation or taking down a receiver and listening to a conversation between others on a party line shall be punishable by a fine of $10.

"They call the place where I live 'Tattle Point,'" said Representative Clark, "because there has been so much listening to private conversation along the party lines and the retailing by gossips of confidential matters not intended for their ears. A great deal of trouble has been the consequence, and I propose to put an end to it."

The following incident vividly portrays the important part prompt, efficient telephone service plays in the transaction of immense deals in the business world. A large wholesale lumber dealer of Boston states that during the past year he has sold about 3,500 cars of lumber, fully 1,500 of which were sold by means of long-distance telephone calls, the sales aggregating more than $1,000,000.

New York Exchange to Be World's Largest

About a year ago the New York Telephone Company purchased, at a cost of approximately $500,000, property at Nos. 18-24 Lispenard street and Nos. 18-26 Walker street, New York, having a total area of about 21,000 square feet. This property has a frontage of approximately 90 feet on Lispenard street and 125 feet on Walker street, and a total depth from street to street of aproximately 200 feet.

It is the intention to erect on this property an initial building of about 17 stories; the foundation and framing, however, will be planned for an ultimate of 24 stories.

The floor plan of the building will be in the shape of the letter L, with a floor area of approximately 14,000 square feet.

It is estimated that the initial building will cost in the neighborhood of $1,250,000.

It is the intention to start the structural steel work and masonry walls about June 15, with the expectation of having the building ready for occupancy about March 1, 1912.

At the start the building will be occupied about as follows:

The first floor will be rented for stores.

The second floor will be used for office space by the New York Telephone Company.

The third, fourth, fifth and about half of the sixth floors will be used by the American Telephone and Telegraph Company for terminal and operating rooms, quarters and offices.

The seventh, eighth, ninth, tenth and certain portions of some of the other floors will be used by the New York Telephone Company for office space for the various division superintendents and their forces.

The Walker-Lispenard Building, New York Telephone Company.

The Western Union Telegraph Company will occupy a portion of the building. It will have operating and terminal rooms there and also some business offices.

The American Telephone and Telegraph Company will install in this building as soon as completed the largest long distance board in this country, having approximately two hundred operators' positions.

Another View of the New Telephone Building

While no local switchboard will be installed in the initial building, it is the intention later on, when additional stories have been added, to install two and possibly three local switchboards which will be capable of furnishing service to approximately 60,000 stations.

The proposed quarters for the central office employes are being carefully considered with a view to giving them adequate locker and dining room facilities and large, cheerful retiring rooms. The company is considering finishing up the roof of the building in order that it may be used in the nature of a roof garden.

In addition to these provisions for the welfare of the central office operators, three large ventilating plants will be installed in order to furnish adequate ventilation at all times for the large number of operators who will be on duty.

Underground trunk telephone lines between Adelaide and Port Adelaide, Australia, are now in operation. The cable measures 8 miles 3,485 feet; the length of wires is 2,700 miles 3,960 feet. The cable cost $22,500; and the laying of ducts, pipes and so on ran up to $11,000, with other expenses for works, amounting to $2,400.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

Of course you've read all the stories that George Fitch has written about Old Siwash, and like the farmer who ate a handful of hay while he looked at a giraffe, you've said: "Oh, shucks! There ain't no such thing." But there is. Old Siwash is real. And like George Fitch, it belongs to Illinois.

Manford Savage entered the University of Illinois in 1874, and like all other freshmen, he proceeded to make Old Siwash over. Every student does that. He does it, whether he is disposed to do it or not. He is forced when he won't hitch and draw with the rest of the bunch. At the time, Savage was fit to do his part. Fresh from the soil, where he had taken all degrees, including country schools from the angle of student and teacher, his lessons were learned face to face with nature. He was ripe for Siwash thrills. He had attained his full height of five feet, seven and a half, but he wasn't as heavy by a quarter of a hundred as he is today. Just a roystering middle-weight, ready for his full share of any program. And if you can get Savage to tell you about the antics of his college days, you'll know that he was a real Savage among the savages, and that there is method in having his son follow in his father's footsteps. For the son of Manford Savage is actually there today, in his sophomore year, and the bill-of-fare hasn't been changed.

He was a Real Savage Among the Savages.

During Mr. Savage's college career the boys didn't have so much money to spend as they have now, but they made every cent count. Savage was only one of many who batched it. Others of his classes did the same, notably Congressman Mann, Judges Butler and Neeley. The scene of these culinary adventurers was the old dormitory, and the cost of living was held down to something like $1.39 to $2.03 per week.

If you will look closely, when Savage tells you about Old Siwash, you will observe that he toys with a *Phi Beta Kappa* charm that dangles from his watch chain. Among frats all pay reverence to the oldest—the one ranking highest—and among men the *Phi Beta Kappa* is in a class by itself.

Time has mellowed the college savages of Savage's day. In his own case you find no trace left beyond the merry twinkle in his eyes. Born in Macoupin county, he is essentially a westener; but to strengthen his claims, he moved to Thayer county, Nebraska, in 1884, where he formed a partnership with C. L. Richards, locating at Hebron. The firm name was Savage and Richards, and the shingle read—lawyers.

It wasn't long until Manford Savage was attorney for the Fifth Judicial District—his first and last political office. He made his canvas when populism was rampant and won as a republican—a perfectly marvelous performance, for Nebraska was populism's hotbed. Savage is a republican because he can't help it, but he's an insurging insurgent of the worst type. The years have thinned his hair, but he has enough left to show his dander. He is mild-mannered, courteous and careful. As speaker, he is never in a hurry and is always in demand. As an executive he is forceful and logical. His business is the law. He is the senior member of the firm Savage and Woods, Champaign, Illinois—which brings us to his home, among his own people, where years of activity among them has brought all the rewards of clean, aggressive citizenship.

Mr. Savage is a telephone man who needs no introduction. Everybody knows him; knows him as the president of the Home Telephone Company of Champaign. For three years he was president of the Illinois Independent Telephone Association. For as many years he was treasurer of the National Association and a member of its board of directors. And now he is president of the National Independent Telephone Association.

Manford Savage was born May 24, 1854, near Girard, Illinois. He attended the University of Illinois in 1874-78. Was married to Miss Anna Arthur in 1882. Moved to Hebron, Nebraska, in 1884. Returned to Champaign, Illinois, in 1892. His interests aside from business, home and family are allied to progressive measures in education and politics. He is Exalted Ruler of Elks in his home city, and in all that great college campus no man is better liked, or more sought for in the alumni.

Illinois Public Service Commission Act

The public service commission act introduced March 22, in Illinois by Senator William M. Brown, from the Sixth district, and drawn by Frank F. Fowle, Chicago, has had no date set for its hearing as yet.

The bill provides for state-wide regulation by one commission, abolishes the railroad warehouse commission, and confers the powers of that body on the new public service commission for the purpose of having a single commission to supervise all railroads, common carriers and public utilities in the state.

The bill provides for a commission of three members, and four heads of bureaus under the commissions' secretary: Counsel, chief engineer, chief accountant and statistician, who will be selected in conformance with the legal requirements pertaining to such position, *i. e.*: residence in the state, their non-participation or interest in any railroad, common carrier or public utility.

The commission is to be appointed by the governor, subject to final approval of the senate. The governor has power of removal from office for misconduct after prefering charges and holding a public hearing. Term of appointment is for three years, one appointment each year, so the terms overlap.

One member becomes chairman of the commission, as designated by the governor. Commissioners have full power to employ their subordinates and retain them as they see fit.

Any one of the commissioners may hold formal hearings and take testimony, but no decision or order is valid unless approved by the full commission.

Provisions of the law are:

Every charge for service or rate for same must be reasonable or fair, and the opposite or unjust discrimination is prohibited.

The commission shall fix rates in each instance where an investigation has been made.

The rate in force at the time the law passes and is accepted is the legal rate; the law is not retroactive.

Every company is required to publish and post its full schedule of rates for service and also its rules and regulations governing service.

No rate can be charged without the approval of the commission.

Any voluntary reduction in rates can only be made after due notice to the commission.

Every company must file a schedule of rate with the commission at the start.

It provides that the property of every public utility must be appraised and valued as fast as practicable.

Complaints are classed as formal and informal. Any twenty-five consumers can make a formal complaint to the commission regarding any service, rates or regulations.

Any public utility can also make a complaint with the same effect, or the commission can make summary investigations on its own motion at any time.

Any single commissioner can make an informal complaint, and if the commission decides he has lawful or reasonable complaint they can start an investigation. In other words, if the complaint discloses any unreasonable rate or treatment the commission can investigate on its own motion.

The commission has jurisdiction over the quality of all service, as well as all measuring devices, and the law provides they shall have facilities for testing and proving such devices or apparatus. They shall also make full test by traveling inspection of the quality of service.

Any public utility can have its measuring devices tested by the commission on payment of a fee, to be decided upon by the commission.

The commission has jurisdiction over public health insofar as it is affected by the service of any public utility, and also over the public safety.

It also has jurisdiction over the safety of the employees of any public utility company, and any accident resulting in death or injury to employers must be fully reported.

The law defines public utilities as follows:

"Any industry, firm, corporation, municipality, and any sanitary or drainage district engaged in furnishing and supplying telephone or telegraph service, electrical energy, water, steam or gas, to or for the public directly or indirectly."

Wisconsin Commission Makes Test Calls

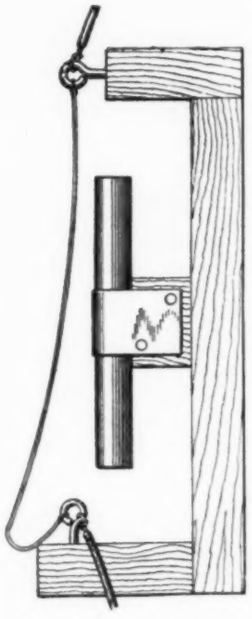
It is related in the forthcoming annual report of the Wisconsin Railroad Commission that during the year ending June 30, 1910, one hundred test calls were made from each of the largest exchanges in the state. Two or three of these exchanges were giving abnormally poor service during the extreme hot weather, so a number of others were tested at the time to ascertain whether those conditions were general or only affected these particular exchanges. It developed that some exchanges were giving better service in the month of July (1910) than they had given the preceding October, which would indicate that the quality of service did not necessarily fall off during the hot weather. The remaining larger exchanges were each given "one-hundred-call tests" during September, and the results of the various inspections plotted. Follow-up inspections were made from time to time to see that the necessary improvement was made. In one case it was found that several operators had recently left and others were on their vacation, leaving the switchboard short of the usual number of operators and with several inexperienced operators among those who were at work.

In addition to the "one-hundred-call tests" described, another group of exchanges furnishing service in cities of a size somewhat smaller than those in the former group, received inspections including fifty to seventy-five test calls. The data obtained from these latter inspections indicate that the quality of telephone service need not be any lower than that furnished in the larger cities. Routine telephone inspections of an incidental character, made in connection with the gas and electric service inspection work, were continued as during the preceding year, except that more attention was paid to following up the tests by correspondence with the telephone companies, and where conditions were bad, making subsequent inspections; also, in some cases, recommending changes which appeared to be necessary. When the first six or eight calls made by the inspector on these incidental tests indicate poor service, it is the practice of the inspector to make additional calls. If fifteen or twenty calls indicate the service to be below standard, the local conditions are investigated and the test followed up by a more complete inspection with a still larger number of calls.

The Telephone Scrap Book

An Interesting Electromagnetic Experiment

A VERY interesting and beautiful experiment for the home laboratory, and one which shows in a very striking way the relation between electricity and magnetism, is the magnetic snake, described by Chancy W. Nieman in the *Scientific American*. All the preparation necessary for this experiment is a bar magnet, a few batteries of any form, and a small amount of very simple construction.



The Electromagnetic Snake.

It is made as follows: A few strands of tinsel, such as is so much in evidence at Christmas time, are braided together to a very flexible electric conductor, as shown clearly in the accompanying illustration. The ends are attached to two screw eyes, which are screwed into the wooden support. A bar magnet is fixed by its middle as shown. Wires from a few dry cells are connected to the two screw eyes. It is best to have a reversing switch, so that the direction of the current through the tinsel can be changed. When the current is turned on, the "snake" will act like a live boa constrictor, coiling itself with great suddenness and velocity around the unsuspecting bar bagnet. Upon reversing the current it will quickly uncoil itself, and writhe around until it is tightly wrapped up in the opposite direction. If the magnet is not painted about the middle, a layer of paper should be put around it to keep it from short-circuiting the tinsel.

The direction which the snake wraps itself is the same as that in which a piece of wire would have to be wrapped to make an electro-magnet with the poles at the same ends as the poles of the bar magnet.

Characteristics of Magnetic Materials

IN testing specimens of iron, steel, etc, for their magnetic properties, a given specimen is tested through a complete magnetic cycle. This means that the specimen is tested from zero magnetizing current, by gradually increasing steps, to saturation, and then by gradually decreasing the magnetizing current, to zero. The current in the magnetizing coil is then reversed and the same routine is gone through. At each step a careful note of the magnetizing force, and the degree of magnetization obtained, is made. From this data is plotted a full characteristic curve for the given specimen under test.

B is the density, degree of magnetization, or number of lines of magnetic force per sq. cm., often referred to as the "magnetic induction."

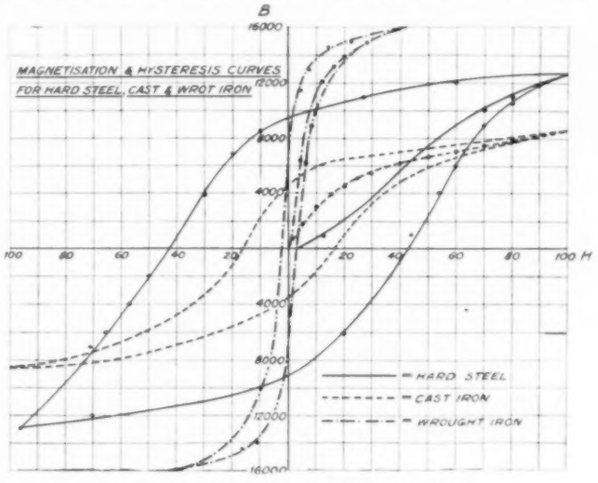
H is the magnetizing force which was applied to obtain the corresponding value of *B* and is a measure of the number of magnetic lines of force which are produced by the magnetizing coil when there is no core. *H* is calculated from the formula—

$$H = \frac{4\pi n C}{10 L} = 1.257 \text{ ampere turns per cm. of length.}$$

In a paper entitled "Iron in Its Relation to Electrical Engineering," read by Thomas Pettigrew before the Glasgow Telephone Society, the curves for hard steel, cast iron and wrought iron, as shown in the cut, were discussed.

These curves are to the designer something like what the indicator curve from an engine is to an engineer—not quite that, but the parallel conveys the idea of their usefulness.

The shape of the hard steel curve suggests stubborn characteristics. The metal is exceedingly difficult to magnetize, but what is more important still, it is also very difficult to free it of magnetism—a valuable property for permanent magnet work. There is good reason to believe that tempering is in some



Comparative Curves of Magnetic Materials.

measure responsible for this peculiarity. When steel is being tempered it is heated to a bright red, allowed to cool till a certain color (red, orange or straw color) shows up on the surface of the metal, and then it is plunged into oil, hot or cold water, or mercury. The sudden cooling causes the surface of the metal to contract, so setting up severe internal pressures, which force the molecules in the mass into very intimate contact with each other. It is reasonable to suppose then the molecular friction is at its maximum, and that it will be difficult to move them out of position. That this is so is fully borne out by the *B H* curve.

It is interesting to note that very good magnets are made by submitting the hot metal to severe pressures in cooling, at the same time subjecting the metal to a powerful magnetizing force.

In the cast iron curve the metal shows fairly good magnetic characteristics. For ordinary magnet work, where weight and space occupied are not of first consideration, cast iron is very widely employed. Very clean castings can now be got and machining is cut down to a minimum. The metal is therefore very

widely used for motor and dynamo field magnet yokes, etc.

Obviously, however, it would be folly to employ this material on alternating current apparatus on account of its high hysteresis loss, etc.

Very little, if any, cast iron is used on the magnetic circuits of telephone apparatus, always excepting, of course, the power machinery.

The wrought iron curve indicates that in wrought iron we have a material showing all-round excellent magnetic qualities. It is very widely used in telephone work. From the core of the induction coil to the armature of the power generator every piece of iron required for magnetic purposes in the telephone exchange is wrought iron.

The curve shows us why this is so, and we note the following important features:

(1) Low magnetizing forces produce good magnetic results.

(2) Moderate forces give much higher magnetic results with wrought iron than with cast iron.

(3) The hysteresis loss is low, as can be seen by the loop area being small.

Strain on Guys and Anchors

THE ordinary construction man has little knowledge of the actual strain upon a given point, and has no means by which he can determine what is necessary to properly hold that strain.

Tables have been worked out and published in

Temp. in Degrees	Length of Span in Feet					Deflection in Inches	Tension in Pounds on 150 Ft. Span							
							Copper			Iron				
	75	100	130	150	200		6	8	10	6	9	10	12	14
							1235	778	488	1719	915	750	495	288
-30	1	2	3.5	4.5	8		5925	373	240	8246	439	360.5	237.5	138
-10	1.5	2.5	4	5	9		5333	337.8	213.	7416	395.6	324.5	214.3	
+10	1.5	3	3.5	6	10.5		4445	281.2	180	6181	329.2	270.3	174.37	
+30	2	3	5.5	7	12		400	241.4	154.6	5562	280	229.9	151.8	
+60	2.5	4.5	7	9	15.5		256	161.4	120	4087	217.5	176.2	116.2	
+80	3	5.5	8.5	11.5	19		232	146.8	93	3201	170.3	138.	91	
+100	4.5	7	11	14	22.5		190.5	120.8	77	2628	139.8	113.3	74.7	

Fig. 1.

W. & M. Telephone Wire News giving the proper sag in inches for the different sizes of wire for spans of various lengths. Fig. 1 shows this data clearly. To this table have been added the figures showing the strain resulting from the pulling of wires of different size or gauge to conform to the table given. This provides a table of ready reference and with such data at hand the construction foreman can, by the use of a demonstrator, pull all of his wires properly and at the same time check the dip or sag by the use of a common foot rule or steel square in the usual manner.

It must be remembered that the guys and anchors when placed either for a corner or a dead end must be sufficiently strong to hold safely and securely the load of the combined breaking strain of all of the wires on the lead; if this is not the case the entire work is endangered.

Fig. 2 gives the actual strain or pull to be provided for each gauge of wire used. This table shows that on a pull of five feet the span should not exceed 120 feet, and the strain to be provided for in guying should be for a No. 6 B. & S. copper, 51.4 pounds; for No. 8 B. & S. copper, 32.5 pounds; for No. 6 B. & S. iron, 71.6 pounds; the guys and anchors should be figured to withstand the strain of the total of all of the circuits which it is proposed to carry on the lead when filled.

The proper placing of the anchor or deadman is of the utmost importance, as upon the anchor depends the strength of the entire structure. We frequently find a guy or anchor placed within five or six feet of

	Copper			Iron					
Pull	#6	#8	#10	#6	#9	#10	#12	#14	Span
5ft	51.4	32.5	20.3	71.6	38.1	31.	19.7	12.	120
10"	112.2	70.7	44.4	156.2	183.1	68.1	43.1	26.1	110
15"	185.2	116.7	73.3	257.8	137.2	112.5	71.2	43.2	100
20"	274.4	172.8	108.6	382	203.3	166.6	105.5	64	90
25"	411.6	259.3	163	593	305	250	158	96	75
Tensile Strath	1235	778	489	1719	915	750	495	288	

Fig. 2.

the butt of the pole on an ordinary lead of five circuits.

The following results would obtain with one circuit of No. 9 iron, two circuits of No. 12 iron, two circuits of No. 10 copper—the breaking strain would be:

2—iron No. 9.....3,014 lbs.
4—iron No. 12.....1,620 lbs.
4—copper No. 10.....1,050 lbs.

With such conditions as this the tension on the guy would be 28,982 pounds and the downward thrust on the butt of the pole would be 28,420 pounds. With the guy placed at ten feet from the base, the strain would be 14,491, and the downward thrust on the pole would be 14,210 pounds.

If the anchor had been placed thirty feet from the butt of the pole the strain on the guy would have been reduced to nearly one-fourth. The same ratio holds true with the thrust on the pole.

A study of Fig. 3, which is worked out on the basis of a strain or pull of 3,050 pounds at the crossarm, will show that with the anchor set five feet from

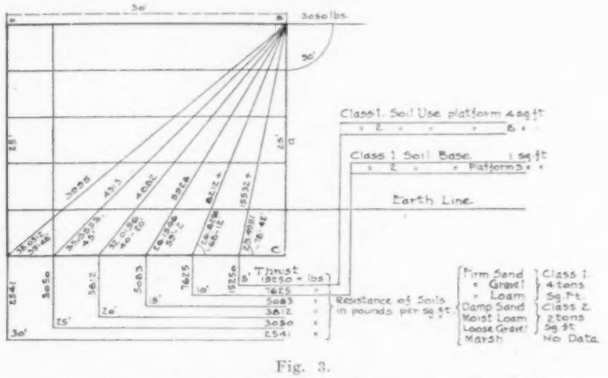


Fig. 3.

Contraction of copper is .0000098 of its length for each degree of Fahrenheit.
Contraction of iron is .0000064 of its length for each degree of Fahrenheit.
Contraction of copper on span of 150′ for each degree .00144 Fahrenheit.
Contraction of iron on span of 150′ for each degree .00096 Fahrenheit.
Total contraction Temp. drop 100 to 30 copper span = .1872 Fahrenheit.
Total contraction Temp. drop 100 to 30 iron span = .1248 Fahrenheit.

Formula for Determining Tension.

$$\text{Tension} = \frac{(\text{Span}^2) \text{ weight per ft.}}{(\text{Deflection in inches})^8}.$$

the pole the strain on the guy would be 15,532 pounds and the thrust on the pole 15,250 pounds. With the guy at thirty feet from the pole the strain is 3,955 pounds and the thrust 2,541 pounds.

It can readily be seen that the trouble is not always with the anchor and guy, but that the downward thrust on the pole is so enormous at times as to drive it into the earth, loosening the guy and causing the guy pole to go over.

Many construction foremen will set a pole on a corner that is not square on the butt or one that has a hollow center, thereby materially reducing the surface. Fig. 3 shows the resistance of the different soils and the necessity of planking or making a base upon which the pole should stand. A concrete base can easily be placed under the butt of a corner pole or guy stub, that will insure its permanency.

Does Current Stretch Its Conductor?

OBSERVATIONS made by Carl Hering and presented before the Franklin Institute appear to show that a force lengthwise to a conductor ought to be produced by the current flowing through it. The force is an internal one which tends to stretch and lengthen the conductor, and therefore does not move it as a whole like an external force would; external movements can, however, be produced by it just as the internal forces in a stretched rubber band can produce external motions.

The following observations or deductions led to the belief that such a stretching force exists:

By the internal forces producing the now well known "pinch phenomenon," the current tends to contract the cross section of the conductor; when the latter is solid, this force cannot manifest itself; but in a liquid it becomes very evident, contracting the conductor at its electrically weakest spot, and if strong enough it may even cause actual rupture. The flow of the material is about as shown in Fig. 1, which represents a lengthwise vertical section of a liquid conductor.

The second observation is the electric arc. When horizontal it forms an arch (whence its name) as though the arc itself, which is a perfectly flexible conductor, were stretching itself, often to the extent of rupture. In this respect an arc acts like a compressed rubber rod, which tends to stretch itself, and if it can do so this stretching force tends to bulge it. (Fig. 2.)

A bent current-carrying conductor flexible at the corner (Fig. 3) exerts a force tending to straighten the conductor; when straight the repelling force of these two parts tends to stretch the straight wire.

Ampere's well known trough experiment is shown in Fig. 4, in which a bridge conductor *B* floating on two mercury troughs, is moved as though the conductors tried to become longer.

As like magnetic lines of force repel each other, and as every current-carrying conductor is encircled by like circular lines of force, these lines must repel each other in the direction of the axis of the conductor, hence produce a stretching force.

A U-shaped copper bar placed into two mercury-cup terminals (Fig. 5) will be forced up out of the cups when the current is strong enough.

In Fig. 6, *a* and *b* are semicircular troughs of mercury. *B* is a pivoted bridge piece connecting the two troughs and free to move around its pivot. The mercury parts of the circuit in both troughs become longer by the clockwise motion of the bridge; hence if the current lengthens its conductor it ought to move the bridge clockwise. It will be found to do so and the force was so great as sometimes to throw the bridge off its pivot. Fig. 7 shows the magnetic equivalent for this arrangement.

In Fig. 8, using only half of the apparatus of Fig. 6, the motion will be as shown, which will be seen actually to diminish the total area, thus giving the reverse effect to that required by the older theory. The rotary motion will be in the same direction when the connections are transferred to the other arm of the bridge and its trough; this causes the area to increase.

In Fig. 9 one of the return wires to the source is placed as close as possible to the mercury trough, thus making the part *abc* of the circuit practically non-inductive. The motion will then be as shown, which at first sight would appear to be a shortening of the mercury part of the circuit; but the non-inductive part

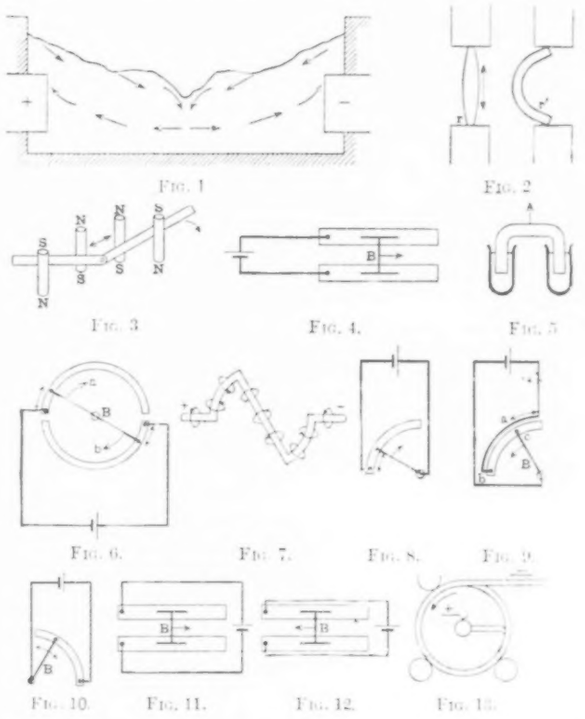


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6. FIG. 7. FIG. 8. FIG. 9 FIG. 10. FIG. 11. FIG. 12. FIG. 13.

Diagrammatic Illustrations of the Hypothesis that a Conductor Is Stretched by Its Current.

abc is now no longer a part of the circuit, as far as the encircling magnetism is concerned, because magnetically its effect is zero. Hence a movement from *c* to *b* really lengthens the circuit by the amount *cb*, but this time in the return part of the circuit.

In Fig. 10 the bridge *B* would move as shown until the tendency to lengthen the curved part of the circuit is balanced by the tendency of the angular part to straighten (as shown in Fig. 3) by the same magnetic forces as those which tend to stretch the wire.

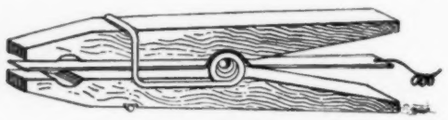
In the following modifications of Ampere's classic trough experiment the same results are shown. The ordinary arrangement was shown in Fig. 4. When the leads are brought around to the other side, as shown in Fig. 11, the motion will be in the same direction as before, thereby diminishing the area of the circuit, contrary to some teaching. By bringing the return wires

very close to the troughs, as shown in Fig. 12, the direction of motion is reversed.

One of the curious consequences is that if this stretching force were large enough a wire should wind itself into a coil, as shown in Fig. 13, and thereby develop a counter E.M.F.

A Simple Contact Clip

A VERY efficient contact clip may be made out of simple materials, according to a plan described by W. P. White in the *Scientific American*. It consists of a strip or tongue of thin sheet copper (or brass) inserted into one of the common wooden spring clothespins, as in the accompanying engraving. The resulting "clamp contact" will take hold or let go instantly, and yet, if desired, it will hold indefinitely without danger of imperfect contact. It will hold anything fine or



A Simple Contact Clip.

coarse, round, flat, or irregular, that is not too big to enter its jaws. It costs less than half a cent, and calls for no other tool than a pair of shears.

But while this device should prove a boon to the electrician who is cultivating his subject on slender financial resources, it is anything but a toy. It allows both contact pieces to be made of soft copper, so that, if copper wires are employed, as usual, no different metal is introduced into the circuit by the contact.

The resistance of such a contact is surprisingly low (0.0002 ohm when clean, or about the same as in the best dial switches); of course, some attention must be given to cleanliness, but no more than with most other types of contact.

If two copper strips, separated by a wider strip of celluloid, are shoved into the same clamp, a two-pole contact is obtained. This can be quickly clamped on a two-pole contact point made of two other similar copper strips similarly separated by sheet celluloid. If the leads are not too stiff and short, the whole can easily be used as a commutator, without any further alteration. Connections are reversed by simply turning the clamp through 180 degrees.

An even quicker commutator can be secured by a slight change in the contact point, which now consists of two U-shaped pieces of sheet copper. These pass through the celluloid, so that the strip which is in front of the celluloid at one end is behind it at the other, and conversely; the commutation then requires merely sliding the clamp along.

The above suggestions suppose a flexible connection to the clamp. This can be avoided (for instance) in a single contact by arranging to clamp a single, bent copper strip so as to join two stationary strips, which are insulated from each other by celluloid.

The clothespin contact has been used to give a simple arrangement for inserting one ammeter successively into several different circuits without interrupting current. At the point where the insertion is to be made, two copper strips run down into the clamp, insulated from each other by celluloid except at the end, where they are usually in contact, closing the circuit. The ammeter leads terminate in two copper strips, which run on the opposite sides of a wooden wedge. When this wedge is forced into the jaws of any one of the clamps, the original contact there is broken, but not till after the ammeter is connected to both sides of the break, so that the current is not interrupted.

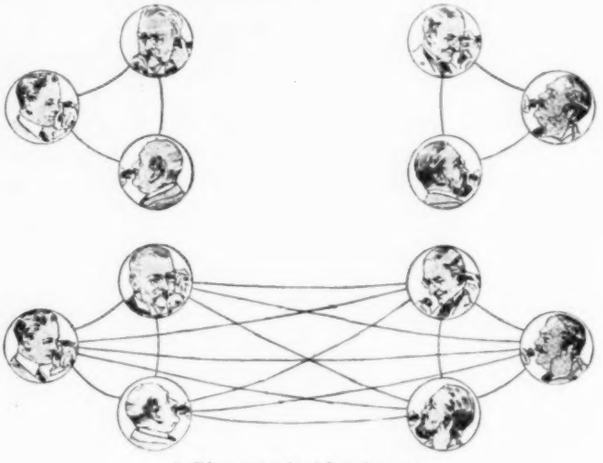
A Diagrammatic Telephone "Ad"

THE accompanying illustration is taken from a current advertisement of the American Telephone and Telegraph Company, appearing in a number of the popular magazines. We have taken the liberty of removing the familiar "Bell" trademark, the better to show the diagrammatic significance of the drawing.

As it stands, the cut, while probably not so intended, furnishes an excellent illustration of the benefits of physical connection. As the reading matter in the same advertisement says:

"When two groups of telephone subscribers are joined together the usefulness of each telephone is increased.

"Take the simplest case—two groups, each with three subscribers. As separate groups there are possible only six combinations—only six lines of communication. Unite these same two groups, and in-



A Diagrammatic Advertisement.

stead of only six, there will be fifteen lines of communication.

"No matter how the groups are located or how they are connected by exchanges, combination increases the usefulness of each telephone, it multiplies traffic, it expands trade.

"The increase is in accordance with the mathematical rule. If two groups of a thousand each are united, there will be a million more lines of communication.

"No one subscriber can use all of these increased possibilities, but each subscriber uses some of them."

The diagram also affords a graphic representation of the basic, but nevertheless often misunderstood principle that the expense per station increases, instead of decreases, with the increase in number of stations. A glance at the cut shows that, supposing each station to get maximum use, six stations connected will each get 15/6, or 2½ times as many calls as three stations connected, and the cost of operation will be proportionate.

A Telephone Crisis in Great Britain

By Herbert Laws Webb*

IT has come to be regarded as a natural thing—a sort of divine right—that the telegraphs of a European country should be a government monopoly, but there is no real reason for this. All the pioneer work in telegraphy was done by private enterprise, the submarine cable service of the world is operated—and operated at very high efficiency—by private enterprise, and the telegraphs of North America, both of the United States and of Canada, are operated by private enterprise and apparently with satisfactory results to the public. In many Continental countries, where the government is extremely centralized and the local government really depends on headquarters, the telegraphs are an important part of the political machine and the public telegraph service is, so to speak, a by-product—and often a by-product of very inferior quality. These conditions do not apply in this free country (England), where there is no necessity for the government to control the telegraphs in order to communicate with governors of provinces or prefects. There has never been a suggestion that government control of the telegraphs here was a political necessity, and the present state telegraph monopoly was set up forty years ago as a business proposition; and it is as a business proposition that it should be judged, both because it is just that the users of the telegraph service should pay a proper price for the facilities and because such an important electrical industry should be worked under sound financial conditions.

The state telegraph monopoly had its origin in 1865, when the late Mr. Frank Ives Scudamore, then a Second Secretary of the Post Office, was directed to report whether in his opinion "the Electric Telegraph Service might be beneficially worked by the Post Office, whether, if so worked it would possess any advantages over a system worked by private companies, and whether it would entail any very large expenditure on the department beyond the purchase of existing rights."

Mr. Scudamore was an enthusiast but not a business man, and his report was strongly in favor of the acquisition of the telegraphs by the state, and he prepared estimates to show that the telegraph service in the hands of the state would be what the city would call a safe business proposition. Mr. Scudamore convinced the Select Committees which inquired into the matter that profit and not "large expenditure" would result. As a matter of fact, the result has been a total expenditure up to date, for capital expended and unextinguished, for loss of interest and for excess of working expenditure over receipts, of approximately £35,000,000. The asset against this is the telegraph system of the Post Office as it exists today, but, as already noted, the system is being worked at a large and increasing annual loss.

When the Telegraph Act was passed the maximum capital expenditure was put at £7,000,000, but within a very few years it grew to almost £11,000,000, and a very large proportion of this was spent in extending the telegraph system after it passed into the hands of the Post Office. The actual expenditure on purchase of telegraph properties was, as finally estimated, between six and seven million pounds. The increased capital expenditure would not have mattered if the estimates of working expenses had been justified in practice; but the working expenses rapidly and steadily increased. Within a few years they were 90 per cent of the gross revenue and for a good many years past they have been over 100 per cent of the gross revenue. The result has been that no payments have been made to sinking fund to extinguish the original capital, and the interest on that capital has now to be paid by the taxpayer, while all additional capital for the development of the telegraph system has to be supplied by the taxpayer and is not charged to a capital account. This is not a satisfactory state of affairs for a great electrical industry, which, in the hands of private enterprise, would be made to pay its way.

The reasons for the failure of the government to run a business on business lines are several, but they may be summed up in the general statement that under political control a technical business cannot be operated on business lines. There is constant pressure brought by the public or by bodies having political influence to obtain reduction in rates, and there is constant pressure brought by the staff to obtain improvements in pay and conditions. Moreover, it is a well-known fact that the same general efficiency of staff cannot be obtained in a government department, where employment is permanent, as can be obtained in private employ, where pay and promotion depend upon efficiency. Some of these causes were very early at work in the state telegraph monopoly, as within four years the working expenses had more than doubled, although the increase of traffic was only 50 per cent. The estimated staff required was 1,529 clerks and 1,283 messengers. Within six months there were 4,193 clerks and 3,116 messengers, or nearly three times the estimated staff, and more than double the aggregate staff of the various telegraph companies which were taken over. These facts were brought out by a committee appointed in 1875, to investigate the increased cost of the telegraph service since the acquisition of the telegraphs by the state, and this committee found that the ratio of working expenses to gross revenue had risen from 57 per cent to over 96 per cent within four years.

Since 1876 there has been no inquiry into the working of the state telegraph monopoly, and matters have been allowed to drift, and currency has been given to the convenient explanation that the large annual loss in working is due to the high price paid for the telegraph properties at the time of the purchase. The figures I have given show that the capital expenditure has no bearing on the present financial results, since there is an actual loss on working and no interest on capital can be paid out of telegraph revenue.

A fact which is a crushing indictment of state ownership of a technical industry is that notwithstanding all the improvements which have been made in

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telegraphy in the past forty years the working cost per message is higher today than it was forty years ago. The message of today averages not much over half the length of the message of the old days of 1s. for twenty words of text, with free address and signature. During the past forty years there have been innumerable improvements in telegraphic methods and appliances. The use of hard-drawn copper wire instead of iron wire, the adoption of duplex, quadruplex and multiplex working, the Wheatstone automatic system and other systems of rapid machine telegraphy have all tended to increase the output of the telegraph plant. Yet with all these advantages and with an average message of about half the length of the message under the 1s, rate, the working cost per 1,000 messages is today £42 as against £40 in 1870.

Such is the financial working of a state monopoly in which in one way and another some 35 millions of money have been sunk, and which has a present revenue *and* expenditure approaching five millions a year. Before discussing the effect of the existence of this monopoly upon other means of electrical communication, it is worth while to take one more dip into history on the question of monopoly. When it was first proposed that the state should acquire and work the telegraphs, a monopoly was not asked for. In fact, the Post Office disclaimed the desire for a monopoly, and argued that in efficiency and economy they would be able to beat all comers. The first Select Committee which examined the Telegraph Bill reported "that it is not desirable that the transmission of messages for the public should become a legal monopoly in the Post Office." In the following year the Post Office pressed for a legal monopoly, on the score that without a monopoly opposing schemes might be started for the purpose of being bought out. The second Select Committee was reluctant to grant the Post Office a legal monopoly, and it is evident that public opinion at the time was opposed to putting such absolute power over the telegraphs in the hands of the Post Office. However, the monopoly clause was inserted in the Telegraph Act of 1869, and henceforward electrical communication became a state monopoly under the control of the Postmaster-General.

EFFECT OF THE TELEGRAPH MONOPOLY ON THE TELEPHONE INDUSTRY.

Some years after Parliament granted the Postmaster-General a monopoly in telegraphs the telephone was invented, and when companies were organized in Great Britain to put this marvellous invention at the service of the public the Postmaster-General brought suit against those companies for infringement of his telegraphic monopoly. The result was that the telephone was found to be legally a telegraph within the meaning of the Act, and the telegraph companies had to accept the Postmaster-General's terms or give up their business. At that date (1880) the Postmaster-General had acquired sufficient experience of the unprofitable nature of the telegraph business under government ownership to be unwilling to experiment with a new invention, the commercial capabilities of which his advisers distrusted. Consequently, the Post Office did not at once go into the telephone business, but licensed the telephone companies to continue the business—under very rigorous terms and conditions. In fact, the early licenses were so rigorous, confining the operations of the telephone companies to certain extremely limited areas, that in a short time the Postmaster-General was forced by public opinion to grant a more liberal license, abolishing the restricted areas and extending the license to the whole country. From the very beginning, however, the telephone was looked upon as a competitor of the telegraph and was compelled not only to pay tribute to the telegraph, but to remain in a relatively subsidiary position. A royalty of 10 per cent of the gross receipts from telephone exchange business had to be paid to the Post Office and the telephone was forbidden to be used for written messages, and numerous other difficulties and restrictions were imposed. Probably the greatest of these difficulties, and one which has worked the most harm to the development of the telephone, was that statutory powers for the telephone companies to run their wires were refused them. All efforts to obtain these very necessary statutory powers have been consistently opposed by the government. Another great difficulty, which has become increasingly acute as the present year has approached, was that the license was made for 31 years from 1880, terminating on the last day of 1911, but no provision was made for the continuance or conduct of the telephone service after the expiry of the license. The government reserved the power in the license to give notice of their intention to purchase the telephone business at intervals of seven years, but this option has never been exercised. The telephone companies therefore have been in the unfortunate position of carrying on a difficult technical industry under these great adverse conditions of lack of statutory powers and of a limited life with an uncertain end. These conditions have completely prevented any broad policy of development of the telephone and the British public have been the sufferers.

At the present time we have 644,000 telephones in service in the United Kingdom, whereas if the telephone were developed in the same ratio in proportion to population as it is in the United States, we should have nearly 3,000,000 telephones in service, and consequently vastly improved means of communication, in every city and throughout the whole country, compared with those which now exist. It has been said by very competent observers that one of the most important items contributing to the commercial and industrial efficiency of the United States is the widely developed and highly efficient telephone service enjoyed by the American community. This service puts city in instant touch with city, and every part of large city areas in instant touch with every other part. The value of such rapid and general communication can hardly be over-estimated, and it is difficult to estimate the loss which other industrial communities suffer from the lack of it. There is no difficulty in building up in this country as extensive and as efficient a telephone service as that which exists in America today. It is a question simply of capital, management and adequate powers.

Time will not permit of tracing in detail the vicissitudes of the telephone business in this country. I have just shown that the fundamental conditions of limited license and absence of statutory powers have been ever-present obstacles, but the fact that the telephone has been regarded as a sort of chartered infringer of a state monopoly has caused it to have a most eventful career during its brief life of 30 years. The state telegraphs, despite the millions of public money which they have swallowed up, have had no inquiry since 1876, and have been allowed to go their

way in peace, but the telephone business, which has been a commercial business and paid its way, has been subjected to one inquiry after another and to one change of government policy after another. At first the telephone companies were chained like a convict by the leg and limited to small areas. Then they were allowed to roam freely over the country and to build trunk lines to connect various centers together. Then the government decided that it would take the trunk lines, in order to protect the telegraph revenue—which had long ceased to exist! There has been a succession of Select Committees on the "telephone question," and for some years in the nineties the telephone companies were hardly left any time to look after their business, so many questions did the management have to answer. In 1899 came the late Mr. Hanbury's policy of municipal competition and of Post Office competition with their own licensee. This policy was frankly intended either to make the purchase of the telephone company's system at the end of the license an easy matter, or else to render it unnecessary for that purchase to be made at all. When it became clear that this policy had failed the Agreement of 1905 was made. Under this agreement the National Telephone Company engages to sell its plant to the Postmaster-General at its value as working plant, and the present aspect of the telephone business is that within a short time it will become a complete state monopoly.

No business man, I believe, looks forward without misapprehension to the establishment of a state monopoly in the telephone. No business man expects either the high efficiency or the wide development of the telephone which his business interests require if the telephone industry is to be subject to political control and to the uncommercial methods of a government department. We have drifted into the present position through the unfortunate error made forty years ago of granting the Post Office a legal monopoly in the telegraph, a step which by many was considered an error at the time, and which was totally unnecessary if the state had been capable of operating the telegraph business efficiency and economically. The telegraphs, as a recent Postmaster-General has said, are past praying for, but no business man wishes to see the telephone industry (which is capable of far greater development and usefulness than the telegraph) go the same way and become a financial incubus for which annual apologies have to be offered.

Our Telephone Manners

Since TELEPHONE ENGINEER published its series of prize-winning articles on telephone courtesy, the press of the country has devoted considerable space to the subject, either quoting from our pages or publishing original articls.

In a recent issue of the New York *Globe*, Graham Hood adds the following to the existing literature of this subject:

"Of course, you are a gentleman! You would be very indignant were anybody to suggest the contrary. You know what the ordinary proprieties of society require of you, and you do not seek to evade any of these responsibilities. Whether you are at home, at your office, on the street, or anywhere in public, you are punctilious in observing all the ceremonies to which society has given its sanction. You wouldn't eat from the tip of your soup spoon or make unnecessary noise at the table; you wouldn't wear your hat in the presence of a lady; you are quick to give up your seat in public conveyances; you do all these things and a hundred or two more, but—how about your telephone manners? That is a question that a man or woman will not care to answer too quickly.

"It is strange what boors we often become when we have the opportunity to let ourselves loose! Take the ordinary man, place him face to face with another man, to say nothing of a woman, and he will behave with all the polish that a century of gentlemanly ancestry could bestow upon him. Put that same man at the other end of a telephone wire and you wouldn't know him.

"Don't imagine, however, that man is the only offender in this regard. A woman on the telephone wire can be precisely as unjust and brutal as a man. Only the other day I called my office from out of town. By a mistake on the part of the operator I was put on the wrong wire, and the reception I received from the "lady" who answered the call was warm enough to have melted any ordinary wire. One would have thought from her tone that I had given her number with the deliberate intent to annoy her. She may have had an excuse that justified her conduct to her own mind, but, unfortunately, I was not in her confidence, and the anger that she so freely vented upon me seemed a most unnecessary waste of energy.

"I have met with these experiences so frequently, however, that they no longer surprise me. I take it as a foregone conclusion that, if I am so unfortunate as to be given the wrong wire, I need expect nothing but a disagreeable reception from the individual at the other end. Once in a while I am pleasantly surprised by being greeted with tones that seem actually human. In such cases I always feel as if I wanted to ask this unknown person to let me call and thank him for his courtesy.

"It is inexplicable—we are generally so courteous to one another (except, of course, when we meet in a subway crush)—why we should be so ready to exhibit the worst side of our nature just because we happen to be out of sight of the person we are insulting. We shouldn't dream of acting so caddishly if we were face to face. If this gentleman accidentally walked into our office when in search of some other person we should meet him graciously, and, if need be, produce half the reference books in the place until we had set him right. It isn't pleasant to think that all the gracious courtesy that we have learned to anticipate is no more than a surface veneer, but after a few experiences on the telephone—what are we to think?

"I have sat in the offices of men who prided themselves upon the nicety of their breeding, and have heard them talk to the telephone girls as if they were slaves put there to be abused by any subscriber who might be in need of some one upon whom to vent an innate irritability. And I have heard these same men speak most courteously to the charwoman, or have seen them hold the door open to let a beggar woman pass. Psychology alone can hold the explanation. Perhaps some day one of the great psychologists may take the time to tell us why the fact that a person is invisible makes us instinctively want to abuse him, even at the cost of all the gentlemanly qualities that we like to feel that we possess."

Telephone Condensers and Their Uses

CONSTRUCTION.

THE telephone condenser in its theoretical essentials differs in no way from the condenser to be used for any other purpose. It consists of two metallic conducting plates, which are separated from each other by a suitable insulation, known as the dielectric. Since the methods of construction used in making condensers for laboratory work are too expensive for telephone use, the rolled condenser, made of tinfoil and paper, is universally made.

While the details of manufacture are interesting, the space here will not permit us to enlarge upon them. It is enough to note, in passing, that each sheet of tinfoil, which is from three to six inches in width and many feet in length, is separated from the other plate or sheet by two sheets of paper. This makes up the core. The core is thoroughly dried by baking, impregnated with paraffine wax to drive out all moisture; pressed to force out all unnecessary wax, and sealed in neat tin cases. The product is the telephone condenser, which is familiar to every telephone man.

GENERAL USES.

In general, the condenser is used for any one of the following purposes:

To prevent direct current from flowing where it

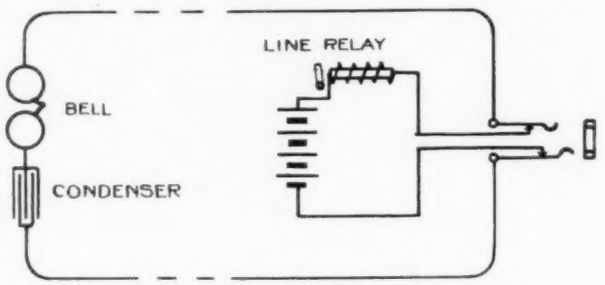


Fig. 1. Condenser Used to Prevent False Line Signal.

is desirable to allow alternating current to flow; to form with coils a local circuit, in which alternating current may circulate in excess of that flowing in other connected circuits; and for the purpose of producing complete local resonance, in order to get either a large current or a pure wave form of both.

We will take up now the practical uses which come under the above general headings.

THE TELEPHONE BELL.

Before the advent of common battery in central office exchanges, the subscriber's bell was simply bridged across the line and rung by the operator in the ordinary manner. However, the introduction of centralized battery for signaling and talking made it necessary to have the two line wires at the substation normally insulated from each other. This is to prevent the current from operating the line relay before the subscriber desired to use the line. Some proposed to use a very high resistance bell, which resistance was to be so high that the line relay could not pull up through it. This, however, was found to be not practical. The simple insertion of a condenser in series with the bell offered a cheap, simple and effective remedy under normal conditions. See Fig. 1. The battery at central merely keeps the condenser charged and no current flows. When, however, the operator plugs in and rings, the battery being disconnected momentarily, the alternating current readily passes through the condenser and rings the bell.

The term "passes through the condenser" must

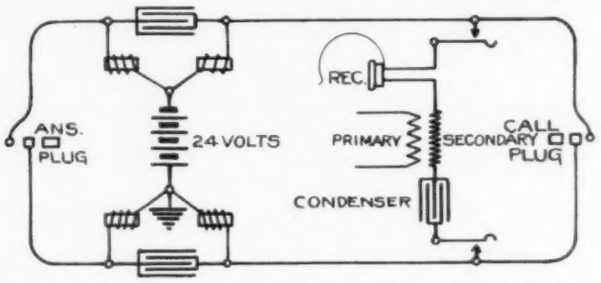


Fig. 2. Condenser Used to Keep Battery Current Out of Operator's Receiver.

be used with limitations for, strictly speaking, the alternating current does not pass through the condenser; each plate of the condenser is alternately charged positively and negatively. That is, a small quantity of electricity actually accumulates on each plate during each half-cycle, and during the succeeding half-cycle is discharged through the connecting wires and the conditions reversed. This gives the effect of alternating current flowing through the condenser, and as far as we are practically concerned, we may say that it really does so.

Of course, no matter how carefully made, every condenser has a certain leakage between the plates, but ordinarily this leakage is so small that we can neglect it. If the insulation becomes so low that it is noticeable, the condenser must be repaired or replaced.

The size of the condenser is quite important, as it affects the operation of the bell. Too small a condenser will not allow sufficient current to flow, and too large a condenser is too expensive. It is possible to choose a size of condenser which will exactly neutralize the inductive properties of the bell coils. When this is done, as much current will flow through the bell

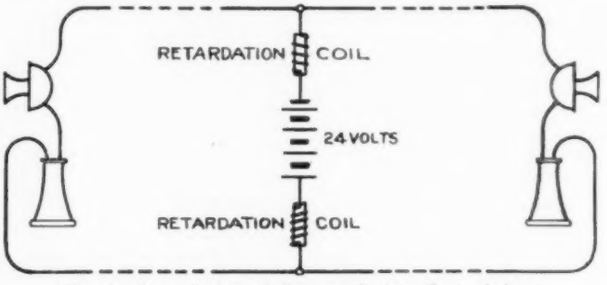


Fig. 3. Stone System of Common Battery Transmission.

as if the latter were a non-inductive resistance. A two-microfarad condenser forms a very good balance for the self-inductance of an ordinary bridging bell. However, there are many bells made which require a condenser of different capacity to give a maximum current. Most manufacturers seem to make little attempt to secure complete resonance in this respect.

THE SECONDARY CIRCUIT.

The condenser is often used in the secondary circuit of a talking set to prevent battery flow through the receiver when it is desirable to secure this result. For instance, on common battery switchboards, a difference of potential exists between the two sides of the cord circuit. When an operator listens in on a connection, she must of necessity connect her telephone set, consisting of receiver and secondary of induction coil, across this circuit. If no means were

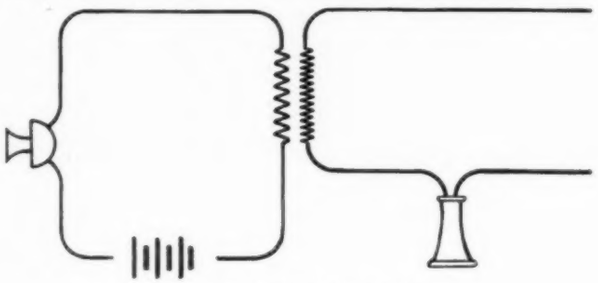


Fig. 4. Simple Local Battery Circuit.

taken to prevent it, this would cause the current to flow through her receiver. Besides producing a disagreeable click in the operator's ear, this current has, or is likely to have, a detrimental effect on the receiver itself, tending to demagnetize the steel magnet and thus make the receiver weak. Therefore, it is customary to insert a suitable condenser in series with the receiver which, while allowing alternating talking current to flow, will not permit battery current to pass. See Fig. 2. Of course, the click will be produced, due to the rush of battery current which charges the condenser. The intensity of this click can be reduced by using a small condenser so that but little electricity is required to charge it. A half-microfarad condenser serves very well, and allows conversation to be held with ease.

THE CORD CIRCUIT.

Although the Hayes common battery system was at first used for supplying current from the central office to the subscriber's telephone, it has been to a large degree supplanted by another form of circuit. The Hayes system employed a repeating coil with four windings. The system that is used by practically all independent manufacturers is a combination of re-

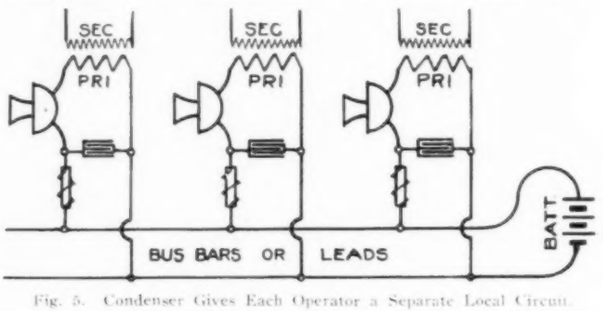


Fig. 5. Condenser Gives Each Operator a Separate Local Circuit.

tardation coils and condensers. See Fig. 2. The former are essentially four in number. Two supplying current to each subscriber. For convenience these two may be wound upon the same iron core, and any or all of the retardation coils may serve the purpose of a relay in operating auxiliary circuits. To connect the two subscribers each line is joined to the corresponding line of the other subscriber by means of a condenser. This permits the alternating talking current to flow from one subscriber to another, but effectually separates the two circuits as far as the flow of battery current is concerned. A two-microfarad condenser is considered standard for this condenser, although in some cases four microfarads are found necessary. This combination, which as yet has received no simple and appropriate name, has been found to give as good, and even better transmission than the repeating coil system. The necessity for separating the two subscribers' circuits is two-fold; first, to insure each subscriber his share of battery current, and second, to render the giving of a supervisory signal separately by each subscriber. Quite an old system, known as the Stone system, employed no condensers and had but two retardation coils. See Fig. 3. While fairly successful for lines of moderate length, it failed where two lines were connected, if one line was very short and the other very long. The short line on account of its low resistance received by far the larger porportion of the current, while the long line received much less current than it would if it had been connected independently to the battery.

The new system, which is sometimes spoken of as "the retardation coil condenser circuit," allows each subscriber to draw battery current independently of other circuits, so that the long line will get all the current which it can draw through its own resistance.

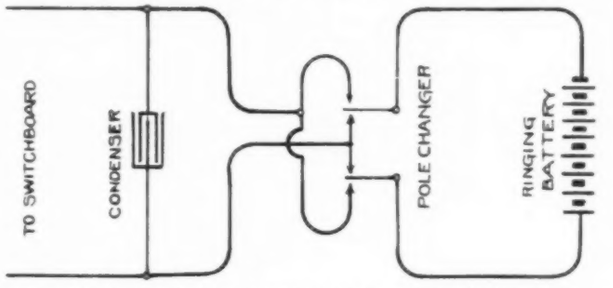


Fig. 6. Condenser Used in Simple Pole Changer to Reduce Spark at Contact and Noise on Parallel Circuits.

The second point, regarding supervisory signals, is very easily understood by the inspection of any common battery cord circuit. Each subscriber, by raising or lowering his hook, can control his own relay and thus give the operator a clear indication of the condition of his telephone.

THE PRIMARY CIRCUIT.

The simplest primary talking circuit is that of the local battery telephone. See Fig. 4. It consists merely of the transmitter, battery and the primary of the induction coil in series, and separate battery must be used for every talking set. If, however, we wish to supply a number of operators with battery current from a single source, the arrangement must be somewhat modified. If all operators' transmitters in an exchange are fed from one battery there exists a great tendency for cross talk between the various sets. This is due to the internal resistance of the battery or to the total resistance, both internal and external, of that portion of the battery circuit which is common to all of the transmitters. In this respect the resistance of the leads from the battery terminals to the center of distribution, or the busbar, acts exactly like internal resistance and should be added to the internal resistance proper. To get around this difficulty it is even

necessary to use a storage battery of very low internal resistance, which means a rather large storage capacity. In many cases, it is found advisable to raise the voltage considerably higher than the transmitter requires and to insert in series with the same, a retardation coil which serves two purposes: First, it limits the flow of current to that which is normal for

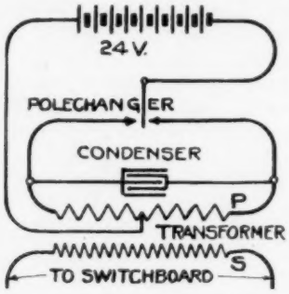


Fig. 7. Pole Changer with Split Primary Transformer.

the transmitter, and, second, it chokes out the high frequency undulation, which otherwise would cause cross talk. The retardation coil would, however, prevent the transmitter from operating if it were not for the condenser, which is placed across the circuit in such a way as to form a local path, which includes the transmitter, primary of induction coil, and the condenser. See Fig. 5. By this means the undulations in battery current caused by the transmitter are kept within this local circuit and are not permitted to affect the other transmitter circuits. The study of this flow of local current is very interesting and also quite complex; in fact, so far as known, the mathematics of it has never been fully worked out.

HARMONIC CONVERTER.

The past few years has seen an increase in the tendency to substitute for ringing current generators of the dynamo type a device of the pole charger variety. In a word, the pole changer is a device for reversing battery terminals, so that the battery may be made to yield an alternating current. (See Fig. 6.) The first pole changer employed primary battery, usually dry cells, and connected together a sufficient number of them to give the necessary voltage, that is from 60 to 100 volts d. c. As the use of common battery for central offices became more general, it was

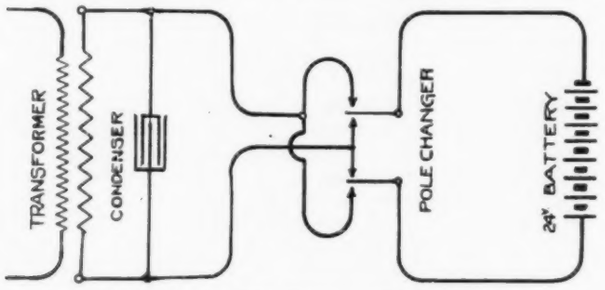


Fig. 8. Simple Pole Changer with Transformer.

desired to use pole changers operated directly from the exchange battery; but the latter had a voltage of 24 to 30 volts, although in some cases it ran as high as 40 volts. This is too low a voltage to operate bells successfully, consequently various types of transformers were devised to step up the voltage of the pole changer to such a value as would be successful for operating bells over commercial lines. At once two difficulties were encountered. First, heavy sparking at the contacts of the pole changer, which would have been felt to a milder degree with the original pole changers. Second, a bad wave form, which under no conditions compared favorably with that given by an alternating current dynamo. To cure both of these evils, condensers are employed in various ways in the primary circuit of the transformer, which is connected to the vibrating pole changer. Fig. 7 shows the essentials of one of these pole changers.

It would be observed that the condenser performs at once the function of killing the circuit, as well as allowing the current to grow and diminish more uniformly through each half of the primary winding.

Fig. 8 gives another type of pole changer circuit, being a simple application of a transformer to the terminals of a regular pole changer. The location of condenser is clearly shown, and further comment on their action is thought unnecessary.

Fig. 9 gives a third form of pole changer circuit.

By comparing these various forms, it will be observed that the first and third differ materially from the second, and resemble each other in the fundamental principle of using a divided circuit. In the first case,

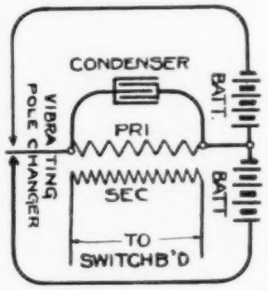


Fig. 9. Pole Changer Working from Split Battery.

it is the primary of the transformer which has a center tap. In the third case,, it is the battery which has a center tap. Each of these systems has its advocates among manufacturers and users, and all have been successful in giving good services.

The importance of proper choice in the size and material of these condensers will be understood by even a casual examination of the operations which take place while ringing current is being delivered.

Michigan State Pays Big Tax

Michigan State Auditor General O. B. Fuller has received a check for $129,000 from the Michigan State Telephone Company, and accompanying the check was a letter informing the auditor that a check would be sent for the interest on the 1909 tax, which amounts to $16,000.

The Michigan State Telephone Company was among those who contested the validity of the law passed at the last session of the legislature exempting from taxation all companies whose gross earnings did not exceed $500 per year. When the companies lost the suit through a decision recently rendered by Judge Denison, of the circuit court, Auditor General Fuller informed all of the delinquent companies that he would like to receive the back taxes due. A year ago the company paid $100,000 of its tax under protest.

Equipment at Sidney, Ohio

By Charles F. Morris

THE Sidney Telephone Company, an independent company operating exchanges at Sidney, Houston and Anna, Ohio, has recently completed extensive improvements at Sidney. The outside plant of the telephone company is in excellent condition, and the development throughout the city is quite high, being nearly fifteen per cent.

Great care was taken in selecting the new equipment, the manager and directors of the company visiting different exchanges in which various makes of apparatus were in operation, as well as the manufacturing plants of several of the largest manufacturers of telephone apparatus before purchasing their present equipment.

The new telephone facilities at Sidney consist of a central battery exchange equipment, comprising two three-position sections of switchboard, a two-position toll desk, a two-position chief operator's desk, a one-position manager's cabinet, a complete power plant and ringing outfit and the necessary auxiliary apparatus.

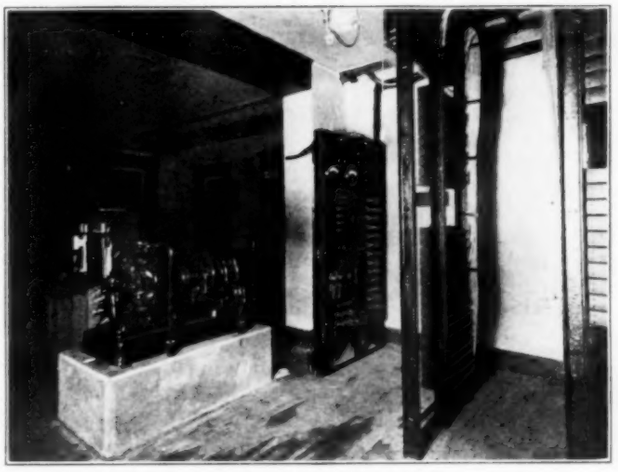
Operating Room at Sidney, Ohio.

Two sections of switchboard are at present installed, the sections being made in three-position units and so arranged that additional sections may be added when required.

The switchboard sections represent the latest development of engineering and manufacturing skill. All the apparatus is mounted on a rigid iron frame, made up in sections and firmly fastened together. The woodwork merely acts as a covering for the apparatus mounted upon the frame. Each section is equipped with a fire screen, which separates the answering jack space from the multiple jack space and effectually prevents the spreading of fire from one portion of the section to another.

The present equipment has an ultimate capacity of 3,000 lines, with 640 lines equipped. There are four regular central battery subscribers' positions, one rural operator's position and one combination rural and switching operator's position.

Of the 640 lines now equipped, 200 of them are



Power Apparatus and Frames.

rural lines. This shows the extent of the rural development in this territory.

The rural line circuit is three-wire and arranged with a lamp signal controlled by a ring-down, double wound relay and a double cut-off jack. The lamp is extinguished and the relay restored by battery from the operator's cord circuit through to ground on one of the windings of the line relay. The rural operator's cord circuit is arranged for universal connections, connecting either two rural lines, two common battery lines or a rural and common battery line. Lamp supervision is provided in either case, the cord automatically adapting itself to the line circuit with which it is connected. The ringing circuit in the rural position includes a five-button ringing and listening key, individual to each operator's cord circuit, and is so wired that straight alternating ringing current may be thrown out on the line.

The twenty rural automatic switching circuits are multiplied conveniently throughout the board and so

Corner of Terminal Room, with Wire Chief's Desk.

arranged that the lamp signal at the rural position is thrown by the insertion of the plug by any subscriber's operator.

The line circuit employs a high, double wound, clickless line relay and a cut-off relay. When the subscriber who desires a connection removes his receiver from the hook, battery flows out through the double line relay, the operation of which lights the line lamp. The cut-off relay cuts the line free from battery and ground, which gives the circuit an advantage over types that leave a dangling ground or battery on the line to interfere with the talking and ringing.

The operator's cord circuits are arranged for individual four-party ringing and listening on each cord circuit. The operator's telephone circuit includes a breast-plate type transmitter, a head receiver, induction coil, flexible cord and plug. Double listening jacks are provided, which allow two operators to be connected to the same position.

New York Commission News

The New York Public Service Commission, Second District, has authorized the transfer by merger to the New York Telephone Company of all the property and rights of the Jefferson County Telephone Company. As a result of this transfer and merger the city of Watertown will have one telephone system instead of two as at present.

The commission has approved of the transfer of the New York Telephone Company to the Otsego and Delaware Telephone Company of certain franchises or rights of the Central New York Telephone and Telegraph Company assigned to the New York Telephone Company in the city of Oneonta, villages of Unadilla, Laurens, Cooperstown and Richfield Springs in the county of Otsego and village of Walton in the county of Delaware. The sum of $98,000 was paid for the property and rights conveyed. The commission holds that its approval of the transfer of the physical properties was not required by the Public Service Commissions law, and has dismissed the joint petition of these companies so far as it relates to the approval of the transfer of the physical properties.

The commission has approved of the tranfer by merger to the New York Telephone Company of all the property and rights of the Trumansburg Citizens' Telephone Company. The Trumansburg company was engaged in conducting a telephone plant and system in the village of Trumansburg, Tompkins county.

The commission has approved of the transfer by the New York Telephone Company to the Allegany County Telephone Company of franchises or rights granted to the New York and Pennsylvania Telephone and Telegraph Company by the board of trustees of the villages of Wellsville and Andover. The commission holds in this case, also, that the consent of the commission is not required for the transfer of the physical properties. The Allegany County Telephone Company is to pay $35,000 to the New York Telephone Company for the property and rights conveyed.

The commission has dismissed the joint petition of the Amsterdam Automatic Telephone Company and the New York Telephone Company for the approval of the transfer of the real estate, physical plant and property of the Amsterdam Automatic Telephone Company to the New York Telephone Company. The commission holds that it has no power or jurisdiction to consent to or forbid the transfer of the physical property of one telephone company to another, its power being limited to controlling the transfer of franchises from one such company to another such company. The proposition submitted to the commission did not propose that the corporate existence of the Amsterdam Automatic Telephone Company should be surrendered or merged or to transfer to the New York Telephone Company any of its franchises.

The commission has closed upon its records the complaint of F. D. Grant, major general, U. S. A., against the New York Telephone Company asking that the New York Telephone Company be required to furnish trunk line service to army posts' telephone switchboards on military reservations in this state. General Grant has written the commission that he now finds that it is a question which concerns the War Department and the Department of Justice, and it is improper for him to take action in relation to the matter.

The commission has served upon the Black River Telephone Company the complaint of the village board and citizens of Lowville alleging that the rates now charged by that company in the village of Lowville are in violation of the terms of a franchise granted to the company. The franchise in question was granted in 1900 and provided for a rate of $15 per year for business places and not to exceed $10 per year for residences. The complaint alleges that the new tariff provides for rates in Lowville at a maximum of $3 per month for business houses and $1.75 per month for residences, scaled down to $3 per month for four-party business lines and $1.25 for four-party residence lines. The company has been given twenty days in which to answer the complaint.

The commission has received a complaint from the village officials of the village of Lyons, directed against the Wayne Telephone Company on account of the raise in rates made in that village on March 1. Up to that time the rate has been $15 per year for residence phone and $18 for office or business places. The rate for office and business houses has been raised to $24 for four-party line, $27 for two-party line and $30 for single party line. The complaint has been served upon the company and an answer required on April 15.

"Day Letters" Succeed Night Letters

The Western Union Telegraph Company has inaugurated a new form of telegraph service called the "day letter." The day letter is designed as the day companion to the night letter, which has become familiar to wire users.

The rate charged for a day letter of fifty words or less is one and one-half times the night letter rate, and for each additional ten words or less, one-fifth the initial charge. For example—the Chicago-New York night letter rate is 50 cents; the day letter rate is one and one-half times that, or 75 cents; with 15 cents for each additional ten words. The New York-San Francisco night letter rate is $1.00; the day letter rate $1.50, with 30 cents for each additional ten words.

Day letters are to be written in plain English, thus avoiding the delays and complications of the code words and code language. They may be filed at any time and are to be transmitted as the facilities of the company may permit during business hours, full rate telegrams having priority of transmission.

What One Woman Thinks

By Sarah Elizabeth Brown

I WRAPPED my arms up in my apron the other day—the first that had the real feel of spring in it, and sauntered out into the barnyard. I hadn't anything on my head—not even my rats. What hair I have was done into a knot about the size of a duck's egg and was anchored in the good old way. It was a relief to be out of doors. The horses were over yonder on the hill getting their first taste of green stuff. The cattle were on the sunny side of the straw stack. The hogs were steaming in their pens. The chickens, particularly noisy, were interested in newly discovered morsels. Birds were singing to beat everything.

Obediah was putting some new tires on the rear wheels and shifting the old ones to the front of his runabout. He had a wrench in his left hand and was warm enough to be without his coat, and what is more important, he was whistling "Comin' through the Rye." The peculiar emphasis he was putting into some of the notes made me curious and I asked him about it. Well, the foolish expression he took on made him more interesting to me than he had been before in a long time. I can't tell you about it. People know who live together for years and years and who get along. He shifted the wrench to his other hand and straightened up. I thought he was going to lie to me, but he didn't. He said: "Lib, I heard that darned tune up to Chicago under circumstances I ain't goin' to forget very soon. I don't know who was responsible for that part of the telephone convention banquet program, but it sure was in harmony with the feed. I refer to the entertainment. I ain't goin' to dwell on the painful subject, but I'm goin' to know the program of the next convention from the outside and know the perpetrators before I get in. An' I'm telling you now that Tillie McMillan's singin' is good enough for me every Sunday mornin' at our church. And as a parting shot, I'm also tellin' you that the countrymen ain't all got timothy seed under their false teeth."

Well that was interesting, and having heard nothing about Obediah's Chicago experiences for a couple of weeks, I pumped him for something more, which I got. He told me that Bert Hubbell's speech was worth going miles to hear. Bert had evening clothes with him and sat at the speakers' bench at the right hand of the toastmaster and two seats removed from a big bouquet that was put up as a screen to hide E. B. Fisher—just as if his whiskers weren't enough! So after a while it came Bert's time to talk. Being all fixed up for the occasion and no money in view made it embarassing, for Hubbell works best when the coin is in sight. He remembered something his mother taught him—a little rhyme of sentiment with a snap to it. Obediah couldn't remember more than the last two lines, and as like as not he's got them wrong for they don't sound like anything I ever taught my children:

Be happy together
And love the Bell wether.

But they brought a hand, so Obediah tells me, and there was so little poetry in that meeting that probably this had a lot to do with it. One of the speeches sounded like a thirty-six sheet billboard advertisement for one of the independent factors, but then the entertainment committee itself should have had some compensation for its suffering.

I'm sorry that I missed that convention, because it must have been unique in being different in a great many ways from those preceding it.

* * *

It begins to look from afar that the Bell was biting hard into the independent strongholds of New York state. The Bell has been wanting those plants at Rochester, Syracuse and Utica for a long time. I want to confess my total inability to analyze the intricacies that have held these systems together. Bert Hubbell himself ought to be amused at the handiwork he has wrought, for his own companies are a series of wheels within wheels. He will watch this new move of the Bell because it is dealing with a similar maze. As a matter of fact Hubbell has 1,300 shares of Rochester, if the papers tell the truth. Hubbell is my ideal as the smoothest of financial artists. He can always get the money, and my brothers, we should revere the man who can do that and sleep nights.

But if the Bell is trying Hubbell's companies at Buffalo, nothing has come to the surface. One at a time then—I started at Rochester. In the system now negotiating there are about 30,000 stations capitalized at $165 per station, or approximately $5,000,000. The deal is working through the Friendship Telephone Company of Syracuse.

New York laws do not restrain the selling of stock and the Friendship Company, exercising the spirit of its name, has been acquiring stock till it is now accredited with control. The franchise of the Rochester Telephone Company is non-negotiable. The franchise has not been sold, but the stock seems to have found new owners and consequently the new medium of control will lawfully obtain. The difference in selling stock and selling franchise is marked, but the result is something else again. If I sell my cream I can't sell my butter, but I still own old Bess and have the reward of her product. The important companies affected and their outstanding stock and bonds are as follows: The Onondaga Independent Telephone Company, stock, $1,255,000, bonds, $125,000; Rochester, Syracuse & Utica Telephone Company, stock, $969,000, no bonds; Rochester Independent Telephone Company, stock, $489,000, bonds, $1,154,000; Utica Home Telephone Company, stock $455,000, bonds, $466,000; Canandaigua Inter-Lake Telephone Company, stock, $40,000, no bonds, a total of $4,953,400, which, with the stock and bonds of several smaller companies in villages, will total over $5,000,000. This is about the kind of layout the Bell goes after and gets. It is a splendidly good system that has been maintained properly by men who know the telephone business from a to izzard.

* * *

There are three bills pending in the Nebraska legislature that seem to be agitating telephone men. One of the bills authorizes telephone companies to sell

personal property. Another repeals the present prohibitory feature of the anti-trust law so far as it pertains to telephone companies; and the third legalizes mergers under supervision of the state commission. It would seem that the independent telephone men are opposed to all three of these measures. Lysle Abbott of Omaha says that should these house bills become law, capital would not interest itself in independent companies because the controlling interest could be purchased by the opposition at any time. Reckoning from a well established precedent, he points to the Bell's unsavory business methods in depreciating the investments of minority stockholders. He also gives voice to the opinion that the proposed laws would give the railway commission absolute power to say whether a competing telephone system is a public necessity or not.

I don't want to cross straws with as able a man as Lysle Abbott, but I wonder if one woman might not have a thought of her own. It is pretty hard, I'll confess, to defend the Bell company, remembering its natural tendencies and some past acts, and I won't, but isn't it true that Theodore N. Vail, present head of the big wire corporations, has shown a tendency to make amends? And is it sensible to continue the fight under a flag of truce?

Mr. Vail has been president of the A. T. & T. Co. long enough to know that his dream of a universal system of telephony and telegraphy cannot be had with monopoly. Every sign is sure on this score. He wants a universal system. He believes in "natural monopoly." But when the bigness of the task and the futility of perfecting it stalk before him, the wisdom of his seventy-four years of activity harkens to an easier plan. Mr. Vail still advocates this natural monopoly thing, but I'm sure he puts an easy construction upon it. He has shown that continued warfare is wasteful—that the waste can be converted to profit and he is willing to share these profits with the independents. I know this old bugaboo about the lion and the lamb. I know that independents are mostly from Missouri, but I also know where interconnection is cutting out the waste. I also know that whether we want to interconnect or not it will only be a short time until there will be legislation for compulsory interconnection and then the arrangements will have to be made through state commissions or state boards of control. That will throw an intricate business, full of paradoxes and technicalities, into politics. Well, I'm too deep into the thing now, so I'll let you think it over. I happen to know where independents have drawn their own contracts for Bell connections and they are doing nicely. My faith in the men who have built independent systems still holds. My faith in all telephone men is the kind that endures and whatever the arrangement I know of no business that is better—a business that runs day and night and Sunday and always at a profit. My advice to Nebraska independents is to go to Lincoln and lobby for your rights. If the measures before the house are inimical to your interests, you know the members personally and can get an audience quicker than you may think. And if the Bell is maintaining a lobby it might be well to get acquainted. The Bell representatives may be a bad lot, but no one was ever known to die as a result of close contact with them.

* * *

It is claimed that all the property and a bond of $50,000 is forfeited to the city of Buffalo by the Frontier Telephone Company, because the taking over of that property by the Federal T. & T. Co. was in violation of franchise. According to the papers, all that Buffalo needs is action by its common council. Will Mr. B. G. Hubbell rise to this occasion as he has always risen to other occasions? "Null and void" has no terrors for Hubbell all the way from the door man of the Chicago Athletic Club to old Senator Parsons of East Aurora!

* * *

Not hearing much from the Morgan crowd these days, are we? The last peep I have heard came in the form of a denial—the Morgan independents (I blush when I say it that way) were denying that when a company within a state makes switch connections with the wires of a company crossing the state boundary there is only a leasing of wires and that the interstate commerce arguments do not apply, which doesn't sound very independenty to me. I fancy, too, that the interstate commission has some knowledge of its business, even if Morgan might set up denials. My old grandfather used to tell me never to admit or confess. There were better ways to circumvent a story. It is evident that he represented the kind of timber that is employed today in high finance.

* * *

In the flurry of excitement attending the sale of those New York companies to the Bell, Stromberg-Carlson stock went soaring on the local stock exchange. The S.-C. Co. is known to be the owner of about $400,000 worth of stocks and bonds in the companies, but are according to report, in no way identified in the transactions. The hint that the Stromberg interests have been amply provided for must rest in coming into the cash represented by their holdings.

* * *

The Wisconsin Telephone Company has finally taken over the Citizens Company at Racine. It must now be so, for the Bell is doing the talking. The stockholders of the Citizens Company accepted $110,000 for their holdings; the two systems are now one system and serve over 5,000 subscribers. Before, each company had about 3,000 subscribers.

* * *

It is gratifying to learn that the receivers of the National Telephone Company, at Wheeling, are making progress. According to a court order, these reports are made monthly and the one for February showed actual cash on hand $373,933.25, a larger sum than any previous statement has shown. The total net earning for February was $34,405.92.

* * *

Pop Reynolds isn't saying much in New York, but he is still there, because Mr. Bethell, of the New York Telephone, is explaining why competition is not necessary on Manhattan island. And to show that Mr. Bethell is sticking fast to tradition, I'll quote him: "In all our transactions we were actuated by the conviction that we were passing through a transitory period of fierce opposition, and that the time was coming when one comprehensive system will practically serve the whole public." And in addition, Mr. Bethell justifies his position by pointing out that when New York forced all lines underground, the telephone company had to go out of town for the necessary funds to comply with the law, and that the New York Telephone is earning only about ten per cent on its investment.

Some Questions Answered

By J. C. Slippy

[This department is at the command of our readers. Questions relating to all branches of telephony—technical, financial, ethical, or otherwise—are invited, and will be answered in the order received. Answers by mail, if requested. Names of inquirers will not be used unless desired.—*Editor.*]

INSULATION JOINTS.

We have an underground cable crossing a bridge over which a street railway runs. Our cable seems to be carrying the current in place of the return mail. We understand that an "insulation joint" would help out in this trouble. Please advise us if this is so, and if possible, describe how a joint of this kind is made.—F. M. C.

IF your cable is in contact with any metal work used as a return for the trolley current, it will be advisable to install an insulation joint at each end of the bridge. The method of making an insulation joint is as follows: The joint should be located in a straight portion of the cable, where it will not be subjected to strains. At the center of the cable on which the joint is to be made, a ring of lead one-quarter of an inch wide is removed, and four inches on each side of this ring two small openings are made. As much paraffin is poured into the cable at these points as it will absorb, and the small holes are closed and soldered. At the point where the ring or sheath has been removed, lamp wick saturated with hot paraffin is wrapped around the cable core in such a manner as will prevent the two sections of sheath from coming in contact. Two layers of tape are then wrapped around the wicking and for about three inches on each side of it, and a heavy cost of asphaltum paint is applied to the tape. Over this coat of paint is wrapped a double layer of tape, followed by a heavy coat of asphaltum paint, the process being repeated until seven or eight double layers of tape are applied. The direction of the tape is reversed on each layer, and each layer overlaps the preceding one. A split lead sleeve is then placed over the tape, care being taken that it does not come in contact with the cable sheath at the insulated end. The seam is now soldered, a wiped joint made at the uninsulated end of the sleeve, and the insulated end is wrapped with tape applied in opposite directions, and the whole given two coats of asphaltum paint. The sheaths of the cable sections on each side of the bridge should be made continuous by means of an insulated copper bond wire carried past the joint so insulated.

CABLE GAUGES.

We are expecting to rebuild our cable plant this season, and will be greatly obliged if you can give us some information concerning cable gauges, what sizes are the most economical to use, etc.—M. R. B.

HIGH capacity cable cuts down transmission as its length increases, but is not so expensive in first cost as a low capacity cable. For this reason No. 22 B. & S. gauge cable with an average mutual electrostatic capacity of .069 microfarads per mile between one wire of a pair and its mate (the remainder of the conductors and the sheath being grounded), should be used for all subscriber loops (distance between the terminal on a cable and the central office), when the length of the cable will not make the resistance of the loop over four hundred ohms for single office districts, and three hundred ohms for multi-office districts. The length of loop for which this cable is used should not exceed 1¾ miles.

No. 19 B. & S. Gauge cable with an average mutual electrostatic capacity of .08 microfarads per mile between one wire of a pair and its mate (the remainder of the conductors and the sheath being grounded), is used for subscriber loops having a length not exceeding 3¼ miles. It is obvious that in cases in which the distance of the terminal from the office is more than 1¾ miles and less than 3¼ miles, the most economical cable would be a combination of cables having No. 22 and No. 19 gauge conductors. For these cases, the following combinations may be used, the 22 gauge cable being placed at the exchange end of the line.

Loops having length of 0 to 1¾ miles, use 22 gauge cable.

Loop having length of 1¾ to 2 miles, use 1½ mile of 22 gauge and ½ mile of 19 gauge.

Loops having length of 2 to 2¼ miles, use 1 mile of 22 gauge and 1¼ mile of 19 gauge.

Loops having length of 2¼ to 2½ miles, use ½ mile of 22 gauge and 2 miles of 19 gauge.

Loops having length of 2½ to 2¾ miles, use ¼ mile of 22 gauge and 2½ mile of 19 gauge.

Loops having length of 2½ to 3¼ miles, use 19 gauge cable.

ANNUAL CHARGES.

Please tell me in your next issue what is meant by the term "annual charges." How are they determined?—R. B. S.

ANNUAL charges as applied to telephone work means the total yearly expense of any construction. They cover the interest and taxes on the sum invested, maintenance expense necessary for keeping the work in first-class operative condition, and the sum set aside to cover depreciation, or the amount necessary to replace the plant when worn out beyond ordinary repairing. Annual charges are a varying percentage of the first cost of the plant, depending on the durability and permanency of the construction.

CORROSION OF CABLE BY CONCRETE.

Our company is figuring on installing an underground system, using concrete ducts, but we were told that there was danger of the cable being eaten by the cement or concrete. Do you know of any cases of this kind? Would you consider the danger from this source worth attention?—B. A. J.

EXPERIMENTS have been made to determine the possibility of serious corrosion being caused by cement or concrete conduit. While corrosive action on the cable sheath was produced, we have never heard of a serious case of this kind, and do not think the danger very great.

Kansas Mines to Have Telephones

The Kansas House has passed a bill introduced in the Senate by Senator Huffman, of Crawford county providing for telephones in mines. The bill is calculated to add to the protection and safety of miners. It provides that in every mine there shall be a telephone running from the bottom of the shaft to the surface.

Public Relations in Telephone Service

By William Dunton Kerr*

A. CHARACTER OF TELEPHONE SERVICE.

THE telephone business differs essentially from most private enterprises. A telephone company is not a manufacturing concern. It is not a distributer of an article of commerce. Its purpose is to furnish a service. Furthermore, the service furnished is a public service. The public has a vital interest in its service. Public convenience and welfare are largely dependent upon it. The business of supplying clean towels to the tenants of large office buildings is a service. It is not a merchandising or manufacturing business. But the service is a private one. In it the public as such has no concern. If it were suddenly discontinued a substitute might readily be found. Telephone service is different. Business and social intercourse could not go on without the facilities provided by telephone utilities.

Readiness to Serve Aspect of Service.—The utility of the telephone depends first upon ability to use the service when desired, and second, upon the use actually made thereof. Telephone service must be available for the use of the public at all times, whether it be actually used or not. The telephone company must be prepared to serve upon demand. Its readiness to serve must be continuous. It may not close the doors at six in the afternoon as the department store may. Ordinarily there may be practically no demand between midnight and six o'clock in the morning, but the telephone company must be constantly prepared to fill extraordinary demands for service at all hours when occasioned by sickness, fire or other unusual occurrences.

SERVICE RENDERED ASPECT OF SERVICE.

Volume and Time of Use.—Service rendered implies public use of the facilities of the telephone. Use is a question of volume or quantity, but also of time. This feature of the service may not be generally understood. The demand of the consumer must be accommodated practically the moment it occurs. No customer of the telephone company may be kept waiting. His wants must be attended to immediately; otherwise he is not receiving real telephone service. The department store does not pretend to give immediate service; the telephone company must.

Uniform Operation Impossible.—Telephone service is intangible. As the public comes in contact with it the service consists of making connections between two telephone lines terminating at different points. These connections cannot be prepared while telephone users sleep and be distributed ready for use in the morning. They cannot be prepared in the summer months, when business is dull, and stored away for use in the winter when traffic is heavy. The manufacturing company can keep its plant running at a uniform capacity day in and day out for weeks, months or years; the telephone plant can be operated only when the public requires its special services.

Relation Between Output and Capacity.—A telephone company is said to have an output. The designation of the output is calls, or messages. The analogy to a manufacturing establishment is supposed to make the business more readily understood, but unless the term borrowed from the private business is applied knowingly the real nature of the telephone product is concealed. Volume of output does not describe adequately the service rendered aspect of the service. An exchange of 10,000 telephones may handle 100,000 calls per day. Perhaps 50,000 calls are handled in two single hours, or 25,000 calls per hour. The capacity of the exchange must be twenty-four times 25,000 calls, or 600,000 calls per day. Thus the capacity is six times the volume of output. Another exchange of 10,000 stations may also have 100,000 calls per day, but the greatest number of calls handled in a single hour may be only 15,000 calls. The capacity of this exchange need be only 360,000 calls per day, or 3.6 times its actual output.

Individual Demands Not Uniform.—Two subscribers use each 3,000 calls per year, or on the average ten calls per day. One of the two averages just ten calls each working day of the year; the other has two calls per day for six months and eighteen calls per day the other six months. The first subscriber distributes his calls evenly throughout the day; the second subscriber does all of his telephoning between the hours of ten a. m. and two p. m. In quantity of service, or volume of output required, they are on a parity; from the standpoint of the facilities required to serve them they differ widely.

OTHER DIFFERENCES FROM PRIVATE BUSINESS.

Capital Fixed and Turn-Over Small.—In other respects the telephone business differs from many private enterprises. A large amount of fixed capital is necessarily employed in the telephone business. In a mercantile enterprise the bulk of the capital employed is invested in goods which are coming in and going out all the time. The capital is turning over frequently. It may readily be diverted from one kind of business to another. It is not necessarily confined to one particular locality. The contrary is true of the telephone business. Money invested in buildings, switchboards, copper wires and cables, poles, transmitters, receivers and other equipment and apparatus, can never be taken out to advantage. It is permanently fixed. The plant and equipment cannot be moved from one locality to another. In 1909 the permanent investment in telephone plant and equipment in the state of Wisconsin was $13,366,168.84. The proprietors of this capital had no means of removing it from the state. The turn-over was much less than this amount. The total revenues from the operation of the properties represented was no more than $3,113,116.06, or approximately 23 per cent of the investment in plant and equipment. From this 23 per cent it was necessary to defray all the expenses of operating and maintaining the properties, depreciation, taxes and interest. It costs a telephone company ordinarily more than $100 per station to build and equip a large telephone exchange; the average earnings per station, however, rarely exceeds $40 per year, and frequently are no more than $30.

Restrictions Unknown to Private Business.—Invest-

*Part II of a paper entitled "Public Relations of Telephone Companies," read at the Fourteenth Annual Convention of the National Independent Telephone Association. Copyright, 1911, by Wm. D. Kerr.

ment in the telephone business, moreover, is charged immediately with a public interest which does not attach to capital employed in private enterprises. So long as the proprietors choose to leave it in the telephone business they must subordinate their personal inclinations in its use and enjoyment to the requirements of the public. Much of the invsetment is in the public highway, where it is directly subject to the exercise of the police power by local governing bodies. The public may order poles removed and lines placed under ground, and the telephone company must comply. Capital employed in private enterprises is likewise subject to the police power, but because of the differences in the character of the public and private enterprises the occasion for its exercise arises less frequently and it is less costly. In other respects the telephone company is subjected to public restrictions which the private enterprise knows nothing of. The telephone company owes a duty to furnish adequate service. Its charges are obliged to be reasonable. Many principles of private business enterprise are wholly beyond the use of telephone companies. They may not pick and choose their patrons. They may not go out into the market and contract for the sale of their services on the most advantageous terms obtainable as the private enterprises may do. They must adhere to regular schedules of charges which do substantial equality to all patrons. To this extent and in other ways the freedom of the owners of capital employed in the telephone business in the enjoyment of their property is restricted and prescribed.

Moral Responsibility of Telephone Company.—The telephone company, also, is under a heavy moral, if not legal, responsibility to the public and the community which it serves. If the cash register factory closes its doors tomorrow a part of the public will be inconvenienced temporarily while present employes seek other employment. If the telephone plant goes out of business the entire community is irreparably damaged. Telephone service must go on. Public welfare imperatively demands its continuance. Managers and employes may not take occasional days off. They are servants of the public, and the demands of the public are inexorable. Unreliable telephone service is worse than no telephone service at all. When telephone service is needed it is needed badly. A tragedy was narrowly averted on a long rural line when a prospective father was relying on the telephone to bring the doctor and at the last moment the service failed him. The telephone manager is a modern Ajax, carrying on his shoulders a large measure of responsibility for the part of the world which he serves. Telephone men are truly servants of the common good.

B. QUALITY OF TELEPHONE SERVICE.

Wide Margin of Safety.—The public demands a high quality of service. Ordinary service is not sufficient. The American public is particularly exacting. The best is never too good. When telephone service is required it is required immediately. It is a good principle of private business to satisfy customers. It is a positive requirement of public business to meet adequately and expeditiously all reasonable demands. A telephone company must provide facilities for the patrons which it already has. It must also make adequate provision for new customers. A difficult engineering problem in the telephone business is to lay out the wire plant, or distribution system, in such a way that service demands of the near future may be accommodated. The company must, within reasonable bounds, foresee the requirements of prospective customers. It is usually necessary to have a comparatively large investment in plant and equipment which is not actively in use. This margin of safety may range anywhere from 15 to 40 per cent. If it were permissible for a telephone company to stop providing facilities at a certain point a difficult service problem would be avoided. Public necessity, however, and a high quality of service will not permit this.

Movements of Patrons Followed.—A telephone plant is undergoing constant changes. There is a large amount of floating plant and equipment in most exchanges. Subscribers fail to renew contracts and move from one location to another. The company must accommodate itself to all such changes; otherwise the service is inferior. This feature is more or less peculiar to the telephone business. The removal of a large user of the service from one part of the city to another may necessitate a radical rearrangement of plant and important changes in the handling of traffic. The same conditions may affect long distance plants. The establishment of new industries at some point on the toll lines may necessitate the construction of new copper circuits; the company must adjust itself to the removal of a large industry from one locality to another.

HIGH GRADE EQUIPMENT REQUIRED.

New Instruments Demanded.—Telephone companies must provide a high grade of equipment and apparatus for the use of the public. Inferior equipment will not do. The service must be certain and reliable. In the early days of the telephone, single iron wires, grounded at switchboards and subscribers' station, constituted the talking circuits. Frequently numerous stations were placed on one line. To furnish a satisfactory quality of service now requires the use of two copper wires for each circuit, and it is usually considered bad practice to place more than two, or at the outside four, stations on a single circuit. Even on rural lines full copper lines are being used to advantage, and in many localities no more than eight stations are allowed on one circuit. Bright and fresh appearing instruments must be supplied. The transmission and phonetic qualities of slightly used instruments may be perfectly satisfactory, but the public objects to the installation of instruments that do not appear to be perfectly new.

Developments in the Art.—The art of telephony is constantly developing. The give a high grade of service telephone companies must keep pace with new inventions and new methods. A telephone company in the full performance of its public duty may not make exclusive contracts for the purchase of equipment or apparatus, or otherwise restrict its ability to take advantage of general market conditions.

Operation of Switchboard.—The intricacy of the telephone switchboard is little understood by the telephone using public. The subscriber demands speed in the handling of his calls, certainty in the connections that are given him, and at all times a uniform degree of courtesy on the part of the company's employes. It seldom occurs to him that he might help the company in its solution of a difficult problem by being courteous, certain and prompt himself. It is probable that the percentage of error in the operation of a large, multiple switchboard is considerably lower than in many other lines of manual employment. Opportunities for error, however, are far more numerous. Who

has not heard an irate subscriber declare, by all that he held sacred and holy, that the operator deliberately gave him the busy signal out of spite? How unreasonable such a statement is! Telephone companies are continually striving, so far as in their power lies, to reduce the number of wrong connections given and unavailing calls recorded. And, considering the complexities of the case, the service in many of our cities is wonderfully efficient.

C. COST OF SERVICE.

Cost Affected by Service Characteristics.—The characteristics of the service which have been mentioned enter directly into its cost. Readiness to serve involves costs in no way affected by the service actually rendered. The cost of service rendered is affected both by the amount of service and the time when it is rendered. The large amount of fixed capital employed necessitates heavy interest, tax and depreciation charges. Inability to seek other fields of investment may add to the risk of the business, which in turn is reflected in the cost of the service. The greater relative subjection to the exercise of the police power, compared with private enterprises, involves expense. The great public responsibility assumed frequently causes large expenditures to be made which might otherwise be avoided.

Cost Affected by Quality of Service.—The high quality of service demanded by the public contributes to and affects materially the cost thereof. If a telephone company could control the demand for the use of its facilities it might effect substantial economies. The furnishing of efficient and well appearing equipment and apparatus adds to the expense. Improvements in the art sometimes result in material economies, but not always. The demand for rapid and certain service has necessitated the establishment in large cities, by those using manual apparatus, of operators' schools, students in which are paid by the telephone companies while learning their trade.

Public Appreciation of Service Problems.—From a social and economic standpoint it is highly desirable to encourage the development of the best possible service and the greatest possible public usefulness. Efficient and high grade service, however, soon runs into money. Telephone companies do not hesitate to furnish the most complete and best service within their means when the demand for such service is accompanied by a willingness to pay a reasonable compensation therefor. By insistence upon restrictive franchises and the adoption of other policies which tend to embarrass unjustly the companies, the public may from sheer necessity defeat its own purposes. On the other hand, by their failure to cultivate relations of frankness and co-operation with the public, and to conduct their business in such a manner as to merit public confidence, telephone companies may in many instances be responsible in like manner for the public's failure to respond to their reasonable requirements. The need of the present day is for an intelligent, sympathetic and respectful understanding of the character, quality and cost of the telephone service, shared alike by telephone utilities and the public. In this way the fullest and highest development of the service can take place, to the mutual advantage of the public and the telephone utilities.

Wayside Service for Rochester

It is announced that Rochester, New York, is to have a system of outside telephones, the first installation of its kind to be made in New York state. The novel plan has been tried out in Detroit with results exceedingly satisfactory to both the installing company and the city at large. Plans for the placing of forty-eight of these outside stations have been matured by the Rochester Telephone Company, the necessary equipment has been ordered and the beginning of the work of installation is only a matter of weeks.

Although it is expected that the initial installation will be supplemented by additional stations, those already authorized by the management of the company will make a possible city-wide service, being placed at widely divergent points and in strategic positions. Care was exercised to select station points readily accessible by reason of converging streets.

For most part these stations will be placed on standards of height sufficient to bring the telephone transmitter to a convenient level for use. The apparatus permanently attached to the standard is compact, being contained in a small iron box, and consists essentially of the telephonic equipment necessary to send messages, except transmitter and receiver. Each of these stations will be tied into adjacent telephone circuits already placed.

The patron of the system inserts the plug of a portable instrument into a hole in the under side of the box, thereby establishing a circuit that for all purposes is precisely like the circuit of a stationary telephone instrument. The operator is called by the connecting up of the circuit, when any point reached by the service may be communicated with and all the certainty of operation is afforded exactly as by means of the stereotyped methods to which the public is accustomed.

It becomes evident, then, that the patrons of the new service must be provided with a portable transmitter and receiver. So compact is this in its leather case that it is no more bulky than a pair of small opera glasses, and being made in large part of aluminum its weight is a matter of ounces. The service will be sold to subscribers and the general system to be followed in respect to patrons will not be essentially different from that employed ordinarily.

Carting companies, taxicab men, deliverymen employed by business houses and various activities which have employees temporarily at widely separated points will be afforded a unique telephone service.

Test of Telephoned Insurance

The validity of the telephone process of taking out insurance by merely calling up an agency and ordering it is being tested in Minnesota in the suit of William H. Gardner, buyer in a Minneapolis department store, against William C. J. Herman, an insurance man.

Mr. Gardner alleges that he ordered $1,500 insurance on his property in the store, over the telephone, and alleges that a clerk on the other end of the line closed the deal with him. The clerk who took the message forgot to write an insurance policy and when the store burned recently he called for his policy. There was none, so he began suit. Herman denies the contract.

Digest of Foreign Telephone Literature

Translated for Our Readers

REINFORCED CONCRETE TELEPHONE POLES.

THE reinforced concrete telephone poles are manufactured by a special centrifugal process. They are made of the best Portland cement and pure quartz sand, with a large quantity of water, mixture being in the proportion 1:3. The cement is cast in a hollow form or mold which can be taken apart, and is made of tin and smooth boards. Into these long permanent molds the steel reinforcements are fastened near the outer circumference of the pole, or at the time near the inner side of the outer wall of the mold. The longitudinal reinforcements are bars of the best rolled steel, which are bound together firmly in short intervals by numerous loops of steel wire. Then the concrete mixture is poured into the form, the pole within its mold is centered within the centrifugal machines and the machines are turned by electric motors at the rate of 500-1,000 r. p. m. Such a speed at least in the beginning is necessary to prevent the mixture within the molds from separating into its component parts, for they are of different specific gravities. The mortar, due to the centrifugal force, becomes closer packed and more compressed and forms a homegeneous mass with the steel reinforcements of the pole. Some of the water which was used in mixing the concrete separates during the process, is forced towards the inner side of the mold and makes the concrete still more compact. The machine runs ten to fifteen minutes, is stopped, and a new form is placed into the proper position after the old one has been removed. The pole just completed is left within the mold for about two days, is then taken out, packed in sand and left there to harden for three to four weeks. All poles are tested for their maximum bending stresses exerted upon them by the wind, and the reinforcements are computed at four to five times this figure. No special account is taken of the tensile stresses of concrete, but the tests have shown that these are negligible and detract nothing from the safety factor of the poles. The coefficient of elasticity was found to be surprisingly high. Fig. 1 shows a forty-foot telephone pole. The poles are cheaper than iron poles of equal durability and are of course vastly superior to wooden poles, as they are not exposed to the disintegration that these are liable to suffer. Fig. 2 shows a general view of the machines which form the poles. Each aggregate consists of several units, which are set in regular intervals exactly in alignment, supporting the entire length of the pole between them. Each machine has an opening at the center. Concentric around these openings and at equal distance from each other are three shafts, which move in a radial direction. At each shaft are two fly wheels, and between these pairs of fly wheels rolls a pipe-like body which has at its sides self-entering tension devices to exert a certain tension on the poles when they are spanned in these machines. All the units which are in precise alignment are driven from a common transmission system.—*Elektrotechnische Zeitschrift.*

Fig. 1. A Sixty-Foot Concrete Pole.

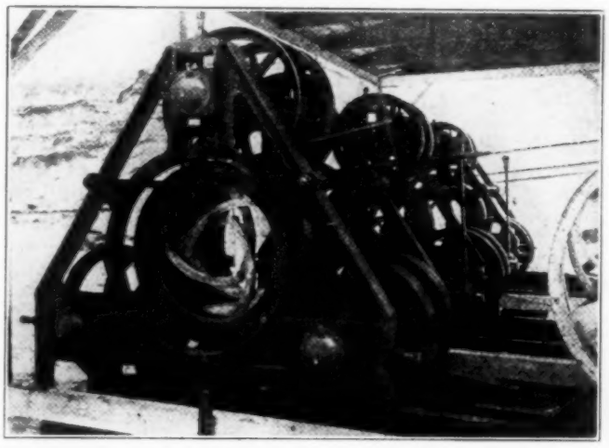


Fig. 2. The Concrete Pole Machine.

FREQUENCY OF TELEPHONE CIRCUITS.

Some time ago some tests were made at the German Imperial Telephone testing station as to the frequency of telephone currents. It was found that the average frequency is about 5,000, and that next to these in importance rank those of 4,000 to 7,000 frequency. These tests are of great importance both from a practical and a theoretical standpoint. The knowledge of these frequencies is necessary in the proper designing of switchboards and telephone apparatus. It brings up another question which has never been answered satisfactorily, though Helmholtz approached the answer to a certain extent. It is the question of the fundamental characteristic of the sound quality in the symbol of a certain tone perceived by the ear as differentiated from other tones of equal pitch and intensity. Helmholtz claims that this sound quality is determined by the addition of harmonic tones of a certain strength to the fundamental sound vibrations. The position of the secondary vibrations as regards the phases makes no difference. This explanation, however, cannot be applied to the theory of the vocal lengths, since these are determined by the additional element of so-called "Formanten," i. e., one or more secondary tones of a certain pitch. Wagner in his investigations found that in telephonic conversations only frequencies of 3,000 to 6,000 took part and that the "formanten" would have to be sought within these limits. In view of the extent and great

variations in human speech the narrowness of these limits is rather surprising. It is, however, favorable for the telephone engineer that he has to deal with such few variations of frequencies in his work. A good telephone system should therefore be designed to transfer frequencies in the neighborhood of 5,000 with as small a dampening effect as possible and not to transfer frequencies which are far apart from each other with the strongest possible effect.—*Elektrotechnik u. Maschinenbau.*

AUTOMATIC TELEPHONE SYSTEM, MUNCHEN-SCHWABINGER.

The automatic telephone system, München (Munich) to Schwabinger in Bavaria, has been working with great success, and a brief description is here given. In this system the choice of a subscriber's line is made by a number of electromagnets which are set in operation by the calling subscriber. The manner of making connections between the automatic central and the subscriber's line is as follows: A certain subscriber, say No. 30,000, wishes to communicate with another line, which we will call No. 31,823. The apparatus consists in the main of a switching disc having the numbers 0 to 9 on the face and holes in the disc for rotation to the proper number. If the subscriber turns the disc from No. 3 to one of the stops, the disc returning to the initial position on its own account sends three impulses of current into the circuit. The telephone is connected by a two-wire line circuit over the jacks of the central switchboard with a pre-selector. By removing the receiver, the pre-selector at the telephone exchange connects the subscriber's line automatically with a free party line selector. As the three-current impulses are sent out by the rotation of the disc, a shaft which carries the switches of the connected party line selector moves upward by three steps. The switches come in contact with a number of line ends which lead to a series of other party line selectors. By means of the automatic turning of the switch shaft, the nearest open line is chosen, connected and at the same time closed to outside interference. At the second rotation of the disc from 1, the contact arms of the connected party line selector are raised by one step, the shaft turns, and connects again automatically the telephone line of the calling subscriber with the open party line. At the third rotation of the disc from 8, the shaft of the third party line selector is moved forward by eight steps. The fourth rotation of the disc makes the connections in the same way over the line selector by raising the shaft of its switches by two steps. In this way all the numbers of the desired line are called, the numbers moved by the disc corresponding to the desired telephone call number. If the line which is being called is open, the call is given automatically by repeated ringing of a bell till the called subscriber removes his receiver off the hook. The line is at the same time closed against any other outside call. The bell of the calling subscriber also rings at the same time, notifying him the desired party is being called properly. Condensers in the party line selectors cause the separation of the telephone circuit between caller and called party. If the called line is busy, then the first and second party lines become automatically free again, and from the first party line selector a sharp buzzing is transferred to the caller to notify him that the line is busy. The wiring scheme is in brief the following: When the receiver is on the hook, one line is connected over a closed contact with the condenser, the ringer, and the second subscriber's line. After the receiver is removed, this contact is opened, and the usual connections with the telephone, microphone and induction coil are made. The pre-selector is to choose an open line and to connect the caller with it.

The lifting of the receiver makes the connections. A call relay is set in operation by this lifting of the receiver, and closes a circuit with an interrupter. The current impulses, caused by this, cause a magnet to set contact arms into rotation. If the moving contacts touch the ends of a free line, the relay receives current, cuts off the magnetic circuit, stops the contact arms, and connects the subscriber with one of the free party lines. Other wiring devices cause the cutting off of calling subscriber's line as also that of the chosen party line when one of the desired lines is busy.—*Elektrotechnischer Anzeiger.*

PROTECTION OF TELEPHONE LINES AGAINST ATMOSPHERIC INFLUENCES AND HIGH VOLTAGES.

The line protecting devices and lightning arresters in low voltage lines as used for telephone circuits must be very sensitive, and the following article describes a few of the common protective devices used in European and especially German telephone exchanges.

One of the most common types is the plate lightning protector. This consists of two metal plates which are placed parallel to each other, with a small air space between them. One of the plates is connected to the wires, the other is grounded. On the inner sides, facing each other, the plates have small ridges or extensions at right angles to each other, and make fine points to give the highly charged current of lightning a chance to leap from one plate to another and then take its path to ground.

A second type used extensively in telephone as also telegraph lines is the silk band protector. In this we have two metal discs separated from each other by a thin silk band. One of the discs is in circuit with the line, the other is ground-circuited. Possible excess voltages take their path over the two discs to earth. On account of the very narrow space between the two discs, which are only separated by the thickness of the silk ribbon, this protector is very sensitive. Should the silk band be torn by the discharge, the band can be unrolled off the spool a little further and renewed between the two discs.

Another very common protector is the so-called spindle protector. This has a spindle consisting of two short metal shells, and a longer third shell, all of which are insulated and placed on a long shaft. Two of the shells are connected with each other by a fine silk-covered wire. The center shell is connected with the earth over a brass disc. The line is conected to this brass disc. The current takes its path from this line over the brass disc to the first shell, then over the silk-covered copper wire to the second shell, and then to the brass disc to which the inside line is connected. If an electric discharge takes place, and is strong enough to burn through the insulation of the copper wire wound around the spindle, a compensating effect of the excess voltage over the insulation of the wire of the third shell and further over the brass disc takes place and the discharge goes then into the ground. All of these protectors are used on buildings. For use on open lines different kinds of protectors are used. One of these is placed in a hard rubber case which has the form of an insulator. The lightning protector itself, as far as construction is concerned,

is a plate protector and has the two metal plates, one of which is connected to earth by way of the rubber casing. The hard rubber insulator has a wooden screw so that it can be screwed direct to the line pole. Another device used exclusively on telephone lines is the carbon lightning protector. This has the same features as the plate protector, only that the plates are of carbon and that the rough surface of the carbon takes the place of the artificial metal projections in the metal plates. These protectors are usually placed in large iron cases which are made waterproof.

A lightning arrester of extraordinary sensitiveness is the vacuum arrester. It is well known that in a vacuum a spark which in the open air has a feeble length will get a considerable length in a Geissler tube. In the lightning protector we have two carbon plates placed inside of a vacuum glass tube at short distances from each other. The glass tube has the shape of a cartridge and has brass caps on both ends, each of them is connected to one of the carbons. The cartridge is mounted between two contact springs, which rest on a porcelain base. One of these contact springs is connected to the line, the other to earth. The sensitiveness of this arrester is so great that at 300 volts a compensation operation takes place.

Of comparatively recent construction and of great effectiveness is the oil lightning protector. This is a metal circular disc which is slowly rotated by some external agent, and whose outer edge is always in contact with a spring. This spring in its turn is in contact with the line, while the metal disc is grounded. The lower half of the disc dips into an oil-filled reservoir. As the disc rotates continuously a fine film of oil is formed on every portion of the surface, and this forms a sort of insulation, and the spring is insulated from the disc. This insulation is of course very thin and is easily penetrated by any electric discharge. But the special effectiveness of the protector rests also in its continual readiness for action, since, as soon as the insulating film has been broken, a new oil covered surface is exposed and the uninsulated part is again covered by a new film of oil.

Special devices have to be used in protecting the overhead wires in cities. Especially where low voltage lines are located above high voltage lines, as used for electric railway current, is there need of special protective devices. Aside from safety fuses and cutoffs, many German telephone companies use the following devices: The subscribers' lines from a central battery exchange are connected as a simple 800-ohm resistance and the battery has one pole grounded as usual. At the subscribers' telephone lines there is an a.c. bell of 1,000 ohms and a condenser of two microfarads, connected with the line. Suppose the telephone wire drops from the pole and comes in contact with the dangerous d.c. 500-volt electric railway line wire. The line going to the subscriber's telephone is exposed to a voltage of 500, but no current can pass over the line, as the condenser, which is now in circuit, closes the path for direct current. To bring this dangerous current to ground is only possible by using a very sensitive lighting protector, and for this purpose a vacuum protector is used as this will react to a voltage of 300. However, a great many exchanges use carbon protectors, which are also very effective and less expensive. To protect telephone lines against the influences of high voltage currents, safety fuses are used. Here we find two kinds, those that melt at 1.5 amperes and at 0.25 amperes. Both of these fuses are to break a circuit in melting in case some high voltage current breaks through the lightning protectors and forms an electric arc between the plates of the protectors. The fuses are usually classed as power current and weak current fuses. Of the former, the most common ones consist of a glass tube having contact caps at both ends and between these a silver fuse wire. This cartridge-shaped tube is mounted in porcelain sockets between clamps and melts at about 1.5 amperes current. For weak current fuses the wires alone are not effective enough, as they are to operate on very low voltage currents, and prevent the formation of an electric arc. Among the most common we find the Bose fuses. These are in the main like the power current fuses just described, but differ in the wire arrangements. With each of the two contact caps a spiral-shaped wire is connected, which wires when at rest do not reach to the center of the cartridge. The spirals are under tension and are soldered at their free ends at the center by an easily fused solder and thus connected with each other. If a current of sufficient strength to melt the solder passes over the protector, the solder melts, the spiral wires being under tension snap away from each other and break the circuit, at the same time forming such a gap that no arc can form between the ends of the fuse wires. In most exchanges all the fuses are connected by a special contact with an alarm bell or buzzer which announces by ringing or buzzing when there is some trouble in the lines.—*Elek. Anzeiger.*

TELEPHONE SERVICE IN FRANCE.

In France there are two different kinds of telephone services, known as main party and subscribers' lines and the public telephone stations. The payments on the part of subscribers also differ to a great extent. A difference is made between the landholders, or as they term them the ground holding subscribers, and the ordinary subscribers, which are classed under the Pausch system. The Pausch payment subscribers must buy their own switchboards and telephone appliances. The telephone management installs the telephones free and keeps the apparatus in repair without charge. However, the costs incurred by the telephone concern are collected in rates of ten per cent of the cost in yearly rates and each year five per cent of the cost of repairs is charged against the subscribers. The yearly rate for the Pausch subscribers is usually from $30 to $80. The government receives a rebate of 25 to 50 per cent. The ground subscribers, that is the real estate owners, have much more favorable conditions in these respects. They receive the switchboards free of charge and the telephones are installed without cost to them. However, if they desire inside telephones in different parts of rooms or offices, they must buy their own telephones and appliances. The toll for the first year for these subscribers is $20, $16 for the second year, $12 for the third year and $8 for every succeeding year. For the first three years an additional charge of $8 is made to cover the cost of the switchboards supplied to these subscribers. The public telephone stations are usually connected to the state postoffice or telegraph lines and are under the management of public officials. The great extension policy of the state telephone lines has almost crowded out the telegraph lines, at least as regards internal service, and the low charges for the telephone service help in this matter. Within the last

ten years 11,400 communities were connected by telephones and France has also accomplished the establishment of international telephone service with nearly all of Europe.

There are 63 long-distance international lines, 915 official service lines between the various departments of the French government and 13,200 lines between other officials of the government departments all over France. The long distance lines are of 2.5 mm. copper wire, while the international lines are of 3 to 5 mm. copper wires, or double metal wires. Between 70 and 80 lines are used for both telephone and telegraph service. All subscribers have the privilege of sending telegrams by telephone and having the messages repeated. Pausch subscribers pay no extra charge for this service, while ground subscribers pay a nominal fee. The telegrams must not exceed 50 words, however, and must be in French. A very common system is the so-called *Avis d'appel telephonique,* or call requests. These are used to inform a third person that he is wanted at a certain hour at a certain place and at a certain telephone to answer a call. The requests are treated like telegrams, but the refusal or the non-finding of the desired person is not reported back to the caller unless specially desired.—*Zeit. f. Schwachstromtechnik.*

The Law and the Telephone

By E. J. Wenner

RATE BILL ATTRACTING ATTENTION.

IN a former issue we called attention to the litigation between the city of Springfield, Mo., and the Ozark Bell Telephone Company, and negotiations looking toward a compromise of the differences between the company and the city.

In the compromise submitted the telephone company objected to the provisions affecting the rates for the business and residence telephones for a period of twelve years, or until the life of its franchise expires. The telephone company would, however, accept the compromise if rates were increased somewhat above the schedule submitted.

Officers of the city claimed that if the company's figures and terms were accepted the valuation would so increase that after the period of compromise expires the telephone company would charge higher rates than at the present.

Though the city attorney of Springfield received instructions some time ago to bring suit against the Springfield Home Telephone Company for the confiscation of its property in Springfield, no steps have been taken to carry out the instructions. The Home Telephone Company was granted a franchise to install an automatic system of telephones. Several thousand dollars was spent in building conduits, erecting poles, etc. No work has been done by this company for about two years, and under the circumstances the property now reverts to the city. It is believed by some of the city officers that at least $5,000 can be realized from the sale of this property, and that a part of the property can be sold to the Ozark Bell Telephone Company and used by it.

At a meeting of the city council of Springfield it was decided that no compromise in the pending litigation be made, and that if necessary the suits be carried to the highest court, even if it should take five or ten years to have an ultimate and final decision.

USE OF TELEPHONE INSTRUMENTS FOR ADVERTISING—RULES AND REGULATIONS OF COMPANY.

Law Department Telephone Engineer:—Would like to hear from you in reference to the placing of a disc on transmitters of the telephones of the Bell Telephone Company where permission is given by the subscriber or lessee. What rights can the telephone company have in way of removing such disc after first getting permission from subscriber, if the instrument is no way injured?

The above inquiry relates to the right of a person to place an advertising disc over the transmitter of a telephone instrument, the disc to be attached by unscrewing the hard rubber mouth piece, placing the disc over the face of the transmitter and replacing the mouth piece.

This opens up the question of the rights of subscribers or non-subscribers to attach advertising device to telephone sets furnished by the different telephone companies. We are all accustomed to seeing different advertisements in use on telephone instruments, and to most of us the right to attach same has never entered our mind. In looking about for a correct answer to this inquiry we must first give consideration to the contract between the subscriber and a telephone company. We find from reading over this contract that a subscriber is a mere lessee and that the title to the instrument and all its attachments remains in the telephone company, or possibly another company who owns the instruments and leases them to the telephone company. We find at any rate that the subscriber has only the mere use of the instrument and that as a user he stands in the relation of a lessee. It is well established that an owner of property can adopt any reasonable rule and regulation as to the use of it in the hands of a lessee, such being true it follows that a telephone company has a perfect right to adopt reasonable rules and regulations to govern the use of its instruments. Practically all the telephone contracts provide that the instruments must not be changed or in any way tampered with by the subscriber and that the subscriber must use reasonable diligence in taking care of the instrument in his possession. Many telephone contracts provide that the instruments must be kept in the same condition as when delivered to the subscriber. Rules and regulations of this kind would probably be interpreted to deprive the subscriber of the privilege of attaching fixtures of an advertising nature to his instrument, especially if the attachment would in any way affect the instrument or wear it or any of its parts and make same less durable. That a person has permission from the subscriber to attach advertising devices to the telephone instrument should hardly make difference in the application of the law, for the subscriber, as above stated, does not have the right to give such permission.

RIGHT TO USE IOWA STREETS WITHOUT FRANCHISE—ROADS—HIGHWAYS.

The East Boyer Telephone Company brought an action against the incorporated town of Vale, Iowa, to enjoin the town and the members of its council, and also its marshal, from interfering with the erection and construction by plaintiff of its telephone line with proper poles and wires along and over the public streets and alleys of said town.

It appears that the plaintiff had appealed to the said town for a franchise to authorize it to construct and maintain its telephone lines and telephone exchange in the said town, but the request had been refused. The company then attempted to construct its lines and exchange without such permission and when interfered with by defendant brought the action as above mentioned.

The court below found in favor of the telephone company and the town appealed to the supreme court.

We quote the following, a part of the opinion of the supreme court:

The statutory provisions directly relied upon by both parties are found in the code and are as follows:

Sec. 2158. Any person or firm, and any corporation organized for such purpose, within or without the state, may construct a telegraph or telephone line along the public roads of the state, or across the rivers or over any lands belonging to the state or any private individual, and may erect the necessary fixtures therefor. When any road along which said lines has been constructed shall be changed, the person, firm or corporation shall, upon ninety days' notice in writing, remove said lines to said road as established. The notice may be served upon any agent or operator in the employ of such person, firm or corporation.

Sec. 2159. Such fixtures shall not be constructed as to incommode the public in the use of any road or the navigation of any stream; nor shall they be set up on the private grounds of any individual without paying him a just equivalent for the damages he thereby sustains.

Sec. 775. Cities and towns shall have the power to authorize and regulate telegraph, telephone, street railway and other electric wires, and the poles and other supports thereof, by general and uniform regulation, and to provide the manner in which, and places where the same shall be placed upon, along or under the streets, roads, avenues, alleys and public places of such city or town, and may divide the city into districts for that purpose.

Sec. 776. No franchise shall be granted, renewed or extended by any city or town for the use of its streets, highways, avenues, alleys or public places, for any of the purposes named in the preceding section, unless a majority of the legal electors voting thereon vote in favor of the same at a general or special election.

In the cases of Chamberlain *v.* Iowa Telephone Company, *119 Iowa 619, 93 N. W. 596,* and State *v.* Nebraska Telephone Company, *127 Iowa 194, 103 N. W. 120,* both of them decided since the adoption of the present code, it was held by this court that a telephone company which had constructed and was maintaining its lines on and along the streets of a city or town under the authority given by Section 1324 of the code of 1873, as said section has been amended by Chapter 104 of the acts of the Nineteenth General Assembly, could not be ousted from the use of said streets, regardless of the existence or non-existence of any franchise granted by such city or town. The stautory provision last above referred to does not differ in any essential particular from Section 2158 of the present code, unless it be in the fact that in the latter the words "public roads" are used in place of the corresponding words "public highways" in the former. On this change in phraseology counsel for appellants rely as authorizing a different construction of the present statutes. They rely, also, as distinguishing this case from those above cited, on the fact that Section 776, above quoted, was first incorporated into the law of this state in the present code.

1. The change of the word "highways" to the word "roads" cannot, as we think, properly be made the basis of any distinction between the cases cited and the one now before us. No distinction of meaning in the use of the two terms is anywhere indicated in our statutory provisions, and we must follow the authority of Chamberlain v. Iowa Telephone Company, supra, in holding that code p. 2158 relates to the constructing of telephone lines in the streets and alleys of a city or town.

2. The cases already cited are not to be distinguished from the case before us on the ground that in each of those cases the telephone company was already maintaining its wires in the streets. In the Chamberlain case the franchise which had been procured by defendant's assignor had expired, and in the Nebraska Telephone case, although defendant relied upon a grant from the city, the court affirmed its general right to occupy the streets of a city under the statutory grant as to highways or roads.

3. Although the cases above referred to were decided since the taking effect of the present code, in neither of them is there any reference to Sections 775 and 776, above quoted, perhaps for the reason that the defendant in each case was relying on some grant of authority antedating the present code in which the provision in Section 776 first appeared.

If cities and towns have, as to the use of their streets for telephone lines, power to regulate only under Section 775, as construed in connection with Section 2158, with the provision in Section 776 that no franchise shall be granted by any city or town for the use of its streets in the construction and maintenance of "telegraph, district telegraph, telephone, street railway, and other electric wires and the poles and other supports thereof," then there is as to telephone lines no occasion for the granting of a franchise and the requirement that no franchise shall be granted except on vote of the people does not apply to telephone lines.

The decree is affirmed.

SAGGING WIRES INJURY ON HIGHWAY.

June 3, 1908, Julia Herlitzke was driving along a country highway in La Crosse county, Wisconsin, when the top of her buggy was caught by a telephone wire of the defendant La Crosse Interurban Telephone Company, which hung loosely across said highway, causing the horses to become frightened and run away and injuring the plaintiff.

The injury occurred at a point where the highway turned at almost right angles, at which point the telephone wire crossed the highway.

One of the poles was guyed across the road and the defendant's theory was that a heavy oak limb fell across the guy wire, causing the pole to straighten and produce a tension, which broke or pulled the insulator off of another pole, allowing the wire to sag across the road. Plaintiff's theory was that the pole from which the wire became detached was so decayed and rotten that it either broke off entirely or bent sufficiently to give slack to permit the wire to come within four or five feet of the ground where it crossed the highway. There was evidence to support the defendant's theory and also evidence to support plaintiff's theory. It appeared, however, in favor of plaintiff that this particular pole had been inspected three years prior to the date of the accident and was then found somewhat decayed, and guy wires were placed on it for the purpose of holding it in position. There was evidence also that no inspection of this pole had been made subsequent to that date and witnesses testified that the pole was rotten and somewhat broken when it was hauled away.

The court instructed that it was plaintiff's duty to prove by a preponderance of the evidence that defendant was guilty of want of ordinary care in allowing the lines to remain in the described condition, and that it was also plaintiff's duty to prove by a preponderance of evidence that plaintiff was damaged and that the damage resulted from a want of ordinary care on the part of the defendant.

There was a verdict for plaintiff and defendant

appealed to the supreme court, which affirmed the decision of the court below.

Herlitzke *v.* La Crosse Interurban Telephone Company (Wisconsin) *130 Northwestern Reporter* Page 59.

ACTION FOR VALUE OF HORSE—NEGLIGENCE OF THE COMPANY IN ALLOWING WIRE TO REMAIN DOWN.

Thomas Wood brought suit in the District Court of Denton county, Iowa, against the Corn Belt Telephone Company, claiming damages of $150, which amount he alleges is the value of a horse caught in the wires of the company, which wires had been allowed to sag to the ground.

The plaintiff's agent drove the horse to the place of injury to deliver some merchandise. After the delivery he started to drive away, and the horse in some manner became entangled in the down wire, with the result that it was internally injured, and on the advice of the veterinary surgeon was killed.

Through a misunderstanding a default judgment was obtained. The Corn Belt Telephone Company filed a motion to set aside the default and open the case for trial upon its merits. A conference of attorneys was had following the filing of the motion and the case was settled by plaintiff's agreement to take an amount considerably less than the amount sued for.

LINEMAN SUES TELEPHONE COMPANY.

Isaac Norther of Columbus, Ala., has filed suit in the circuit court against the Citizens Telephone Company for $25,000 damages. Plaintiff claims that while he was employed by the company as a lineman and while working on a defective pole he was thrown to the ground and received injury to his head and back. He alleges in his complaint that his injury is permanent and that he is injured mentally as well as physically. He asks for $25,000 damages.

USE OF STREETS HELD A LICENSE REVOCABLE AT WILL OF COUNCIL.

The court of appeals in Frankfort, Ky., has decided that a right to use the streets of the city by telephone companies, granted in 1881, was not a franchise but merely a license, which the council can revoke on ninety days' notice, and then adopt an ordinance preventing operation without first securing a franchise so to do. This holding would seem to settle the law in that jurisdiction on the question of the necessity of a franchise to operate within the limits of a city.

CITY DOES NOT APPEAR IN RATE CASE.

At Paducah, Ky., the East Tennessee Telephone Company has brought suit to restrain the enforcement of the Paducah telephone rate ordinance. The city will not be represented when the matter is argued, the council giving as a reason for its absence a desire to await the action of the Citizens' Association, to see whether the public is behind the city before spending more money.

WOMAN CLAIMS HUSBAND SOLD HER TELEPHONE PROPERTY WITHOUT AUTHORITY.

Mrs. Melissa Polley of San Antonio, Texas, brought suit against E. G. Millican for $2,600. She claims the defendant purchased the entire property of the Sutherland Telephone Company from her husband, J. L. Polley. She alleges further that her husband had no right or authority to sell said property and brings this suit to recover the value of same.

Interstate Commission Demands Reports

All telegraph and telephone companies doing an interstate business, being common carriers subject to the provisions of the interstate commerce act, must make reports regularly to the Interstate Commerce Commission, must impose only reasonable and just rates and charges and are forbidden to give any unreasonable preference or advantage by rebates or otherwise to anybody.

The commission in pointing this out in any official expression on questions arising under the act, particularly its provisions specifically applying to "telegraph, telephone and cable companies, whether wire or wireless," held that a company doing a wholly intrastate business is not subject to the act unless there be an arrangement between that company and others for the continuous transmission of interstate messages.

Bill to Increase Minnesota Telephone Tax

Senator John Moonan, in a bill introduced in the Minnesota legislature, would place telephone companies on a higher gross earnings taxing basis. For the purpose of taxation he classifies the companies as follows:

Class A, companies whose annual gross earnings are $1,500,000, or more, to be taxed at the rate of six per cent, on the gross earnings.

Class B, companies whose gross earnings are $800,000 a year, or more, to be taxed at four per cent on the gross earnings.

Class C, companies earning less than $800,000 annually, to be taxed at two per cent a year on the gross earnings.

All telephone companies now pay three per cent on gross earnings.

Change in Value of International Volt

January 1 the United States Bureau of Standards adopted a new value for the electromotive force of the Weston normal cell:

$E = 1.01830$ international volts at 20° C.

This is equivalent to an increase of approximately 0.08 of one per cent in the value of the international volt. The change will affect to a slight extent all measurements of electric current, electromotive force and power, and will in some cases require slight changes in electrical measuring instruments.

The Pacific Telephone and Telegraph Company has purchased for an aged woman a brand new darning ball.

For months complaints came in thick and fast about the farmers' lines being dead every Friday. Manager Garliner sent to San Francisco for an investigator. He was on the ground a day and then sent back to San Francisco for the darning ball.

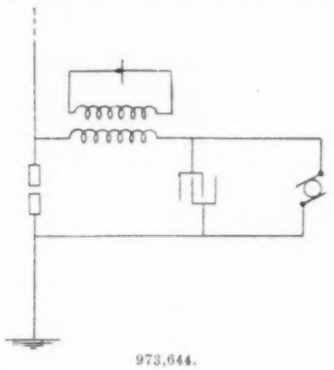
He had discovered that an old woman had been in the habit of taking the receiver off her telephone every Friday morning and all that day and the next using it for a darning ball in mending socks.

Recent Telephone Patents

By David S. Hulfish

972,874. Automatic System. Bernhard Kugelmann, Bad Kissengen, Germany. In a system in which each calling line automatically selects an idle trunk, the trunk switches are so arranged that as each becomes busy it starts the next switch to respond to the next calling subscriber.

972,962. Meter System. Alfred Weiss, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. The meter is in the central office, its coil in series with the cut-off relay, the meter remaining unoperated for low currents sufficient to actuate the cut-off relay only.



973,644.

972,988. Party-Line Indicator. James H. Blythe, Denver, Colo. A device for the subscriber's telephone set. It displays a target with the word "Busy" when the telephone line is in use.

973,198. Attachment. John F. Hines, Pittsburg, Penn. A holder for the telephone receiver while being used.

973,644. Wireless Telephone. Lee DeForest, New York. In a system for transmitting speech by free magnetic waves, are arranged antennae for radiating the waves, a singing arc circuit to create high frequency electrical oscillations, and a telephone transmitter and induction coil for varying the amplitude of the oscillations.

973,962. Selector Switch. E. B. Craft, Chicago, Ill., assignor to Western Electric Company of same place. A selector switch for automatic central offices. The contact bank is a cylinder, and the brushes act to bridge contacts to collector segments; an auxiliary switch acts as a brush selector.

974,110. Transmitter. Garrison Babcock, Rochester, N. Y., assignor to Simplex Telephone Equipment Company, of same place. A transmitter resistance button is composed of a rigid and a flexible electrode with a current-modifying medium between.

974,506. Attachment. Harry M. McAlarney, Puritan, Penna. A telephone receiver holder for desk portable telephones, for holding the receiver while in use. A crank part is carried by the attachment for operating the hook lever of the desk telephone stand.

974,866. Automatic Telephone System. Alfred H. Dyson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. In an automatic telephone exchange where the number of switching devices in the exchange is less than the number of lines to be switched, so that each line may not have exclusively a switching device, it is necessary to appropriate a connecting device to each call; the present invention provides such a system, the connecting switches having a master switch assigning them to duty in order and operating further to identify the calling line.

974,955. Meter for Automatic Exchange. A. H. Dyson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. In connection with a full automatic telephone central office, a meter for each trunking equipment is provided and is so associated with the circuits of the system that it will record only the total number of completed connections.

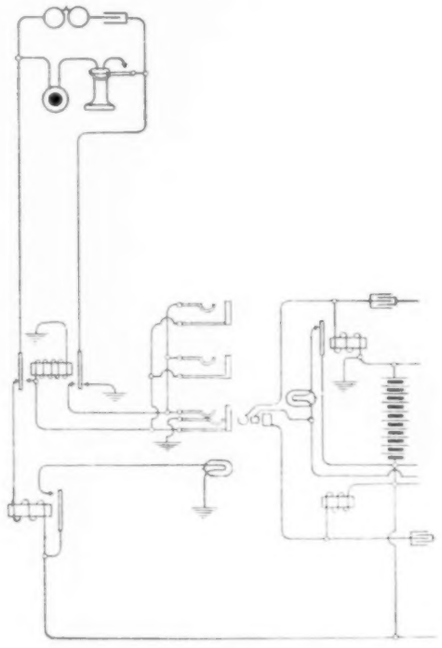
974,957. Attachment. Wallace G. French, Oakland, Cal. The attachment comprises a card directory, combined with means for attaching it to the standard of a desk telephone.

975,105. Semi-Automatic System. Charles R. Austin, Long Beach, Cal. Automatic branch exchanges or sub-exchanges are established in connection with a manual central office, automatic selectors being installed at the sub-exchanges and operated from the manual switchboard at the main exchange. In operation, the manual switchboard manually selects the selective impulse transmitter and the impulse transmitter then acts over the trunk line automatically to select the subscriber's line at the automatic sub-exchange.

975,346. Attachment. B. F. Gardner, Chicago, Ill., assignor of one-half to S. R. Salinger of same place. The transmitter mouthpiece is provided with spark-gap electrodes and the ringer is surrounded with a spark coil, whereby ozonizing sparks will be formed in the transmitter mouthpiece to disinfect it whenever the ringer is rung.

975,504. Switchboard System. C. C. Bradbury, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. The novelty lies in closing a path for both supervisory lamps by a ground contact in the answering jack, then controlling the lamps separately by supervisory relays.

975,525. Manhole Form. P. G. Harshbarger, Hyde Park, Mass. A collapsible form, to be placed in an excavation and, after the concrete has set around it, to be collapsed and removed.



975,504.

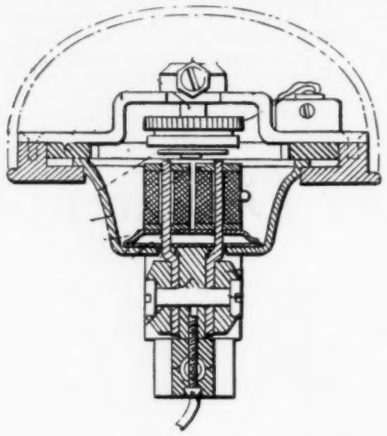
975,530. Automatic Switch. William Kaisling, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. An arrangement of automatic switch and the relays and magnets controling the switching members so that all of the switch, relay and magnet terminals are accessible from one side of the switch mechanism.

975,529. Automatic Switch. William Kaisling, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. A switch comprising two sets of wipers, one

upon a central shaft and the other upon a secondary shaft sleeved upon the first.

975,608. Automatic Switch. A. H. Dyson, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. An automatic selecting switch having a spherical contact bank. The claims call for "rotating the contact ends to select a row," and then "rotating said contact ends in an intersecting plane to select a contact of a row."

975,933. Telephone Relay. Samuel L. Campbell, Prairie City, Oregon. The fundamental construction is the line helix and variable resistance. The movable electrode of the resistance unit carries a free armature which is spaced opposite



975,933.

the ends of the cores of the line or receiver helix. The structure is much the same as would be produced by cutting out the front of a transmitter case and substituting a receiver shell for the transmitter diaphragm.

976,050. Composite Telegraph and Telephone System. Edward R. Cunningham, Des Moines, Iowa. The telegraph circuit is upon the phantom of the telephone line, and is an open-circuit telegraph deriving its energy from a high-tension auxiliary line wire.

976,123. Selective Trunk. E. E. Clement, Washington, D. C., assignor to North Electric Company, Cleveland, Ohio. In a manual trunk, there is provided at the B end selective means for enabling the A operator to select a suitable source of ringing current to ring selectively upon a party line.

976,184. Meter System. G. A. Joy, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. A meter for each line is located at the central office and each cord pair has means for operating the line's meter; but it is possible to operate the meter only after the conversation has been terminated.

976,196. Substation Telephone Circuit. J. J. Lyng, East Orange, N. J., assigner to Western Electric Company, Chicago. In connection with the standard American Bell type of substation telephone circuit, an added contact is placed upon the hook switch for reducing the capacity of the condenser when the telephone is hung upon the hook. By this means, the condenser of larger capacity is used for talking and the condenser of smaller capacity is used for ringing.

976,230. Receiver. H. R. Stuart, Newark, N. J. An armature distinct from the diaphragm is connected to the diaphragm and is operated by solenoids within the receiver case.

976,241. Trunk. C. S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. In connection with the trunk circuit is an automatic ringing key and provision for the release of the key by a called subscriber.

976,298. Party Line. Homer J. Roberts, Evanston, Ill., assignor to Homer Roberts Telephone Company, Chicago, Ill. In a sectional telephone line, a section extends from central office to the first station, and from station to station beyond, and relays are provided whereby the sectional line is built up in section to the stations desired to be called, but current cannot flow to the succeeding station during the pulse which effects the closing of the circuit leading thereto.

976,457. Attachment. Josephine A. Hall, Oakland, Cal. An antiseptic attachment for transmitter mouthpieces.

976,524. Automatic Telephone System. Harry G. Webster, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company of same place. Circuits for a full automatic telephone system are shown. The seventy claims cover both specific switch construction and the circuits of the system. Percentage trunking is used, with the decimal selection of the desired line.

Wisconsin Telephone Tax Bill Protested

Fifty representatives of telephone companies of Wisconsin appeared at a joint hearing of the senate committee on finance and the assembly committee on taxation and spoke for the Kneen bill, providing for a minimum license fee of $15 a year, and a percent tax of the gross earnings, and against the Teasdale bill, providing for the taxation of telephone companies on an ad valorem basis.

State Treasurer A. H. Dahl spoke in favor of the Teasdale bill. The telephone men who spoke were Attorney Fred C. Ellis and H. O. Seymour of Milwaukee, representing the Wisconsin Telephone Company; J. C. Crowley of Superior, Richard Valentine of Janesville, Paul J. Weirich of Monroe, R. M. Richmond of Evansville, W. F. Goodrich of La Crosse, E. A. Miller of Hixon, John C. Gaveney of Arcadia and others. Earlier in the day they appeared before the assembly committee on express, telegraph and telephone and urged the passage of bill No. 886A, authorizing the state railroad commission to require physical connection between telephone companies and prohibit duplication of lines.

The telephone men also called on Gov. McGovern and discussed the ad valorem taxation bill with him. He told his callers that he believed telephone property should be taxed on an ad valorem basis.

Chicago Council Passes Merger Provision

The Chicago council has passed a resolution by Alderman Pringle of the third ward, which fixes the general terms on which the Chicago Telephone Company is to be allowed to purchase the automatic telephone system which is being operated in the Illinois Tunnel.

The Pringle resolution asserts that telephone competition in Chicago is productive of waste. It then asserts that the Chicago Telephone Company only be allowed to charge to its construction account the purchase of such property of the automatic telephone company as is not a duplication of the existing property of the Chicago Telephone Company.

So far as known, no negotiations are contemplated involving the merging of the competing plants.

Texas Telephones Hampered by Taxation

The actual value of telephone properties in Texas is said to be less than one twenty-five-hundredth of the taxable property. The assessed value for the year 1910 was about one-three-hundredth of the assessed valuation of all property in the state. The laws of the state require that telephone companies must pay one and one-half per cent of their gross receipts, which in many cases amounts to ten per cent of the net earnings. As a result of these stringent laws, during the last five years Texas has fallen in rank from the eighteenth to the twenty-eighth state in telephone development.

DEPARTMENT of RAILWAY TELEPHONES

Advantages of Telephone Dispatching

John A. Kick

WITH the first installation of the telephone for train dispatching purposes, opposition was met with in the form of arguments against the safety, speed and ease of operation, but all of these arguments have been satisfactorily met by the demonstration of continuous, effectual operation.

It is safe to say that the merits of the telephone against the telegraph for train dispatching have been fixed definitely in the minds of the railway operating directors, but the public relying on a general source of information may be misled by statements of those who are prejudiced against the telephone by reason of their sentimental tendencies toward the old time method and their dislike of radical changes.

All railway officials are necessarily deep students of safety and this most vital question is constantly drilled into the minds of their subordinates; and it is scarcely to be supposed that they have thrown prudence to the winds in adopting the telephone as the standard method of train dispatching.

John A. Kick.

The comparison of speed in handling train orders by telephone against the telegraph has resulted in discussion of considerable length, and no real, definite statement can be made as to the saving of time, as every effort to compute the actual time saved has been based on the interval between the time when the dispatcher started to send and the time the order was complete, instead of the time consumed from the first call to the completion.

Upon the first basis, a very careful comparison on a number of days work by the same dispatcher in handling the same class of work, the telephone has shown an average time saved of 2.4 minutes per order; and had the time been computed on the second, or true method, the average time saved per order would certainly have made a much greater showing.

Even should the telephone and telegraph stand on equal footing as to the time required actually to call all officers and complete an order, there would yet remain to the telephone the advantage of the rapid transmission of general information important to the dispatcher in his work.

By the telegraph method no one except a telegrapher could converse with the dispatcher and in case of accident all information would come second-hand through the nearest telegraph station. Any one who has dispatched trains can recall most vividly the trying wait for enough details upon which to base action as to the amount of relief necessary and the best point of application.

By the telephone method a telephone can be maintained not only at all open stations, but at all sidings and, if desired, at chosen intervals of say every two miles along the entire division, thereby providing a means whereby the trains are always within a few minutes of a point where the conductor or engineer can get into direct communication with the dispatcher and quickly give the details of any

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical developments, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

Advantages of Telephone Dispatching. By John A. Kirk..... 225-226
Installation Completed on N. Y. C. "Old Road."..... 226-227
A Study of Telegraphic Transmission. By Frank F. Fowle..... 227-229
Portable Telephone Sets..... 230
Northern Electric Tries Telephones..... 230
Telephones on the Pennsylvania Lines. By Charles L. Mulligan.. 231-232
Manufacturers Exhibit at Railway Convention..... 232
Copper Clad Wire for Dispatching Circuits..... 232
Selective Train Order Signaling..... 233

situation which may arise along the right of way.

Some of the railways are equipping their trains with portable telephone sets and means of attaching to the telephone lines, making it possible for the train crew quickly to get into communication with the dispatcher from any point between the terminals.

In successful train dispatching, the dispatcher does not wish to allow a train to be delayed by waiting for orders, nor does he allow himself to run behind in keeping up his train sheet; but it has been found that a telegraph dispatcher on a very busy piece of single track railway must, on many occasions, choose between delaying trains by having them wait for orders or else forego the advantage of having his train reports from all stations, whereas by telephone he may be preparing to put out an order with several stations and at the same time receive several reports of trains passing other stations, as the signaling for one station does not interrupt the conversation with another.

The "time saved" factor is so great as fully to justify the railway operating directors in the choice of the telephone in its general efficiency in train dispatching, and it is to be noted that the dispatchers have personally benefitted by the relief from the heavy strain of eight hours of hard work in deciphering every brand of indifferent Morse in addition to planning their train movements, and are almost unanimous in their expression of general satisfaction with the change.

The telephone circuit for train dispatching is equipped with some type of selective signaling whereby the dispatcher is enabled to ring any station desired, the call being received through the medium of a four-inch gong set in motion at the called station. If two or more circuits are used at any station, different toned gongs are used.

Where operators are required to work about the station as ticket and freight agents, the telephone has been a great relief to them, as the calls are so loud as to be heard to all parts of the average small way station, whereas by telegraph they were either forced to remain close or neglect their other work, as among the confusion of several instruments constantly clicking away one must recognize a call which in volume is not one-tenth that of the telephone bell.

When a dispatcher puts in a call by the selective signaling system, another station may come in on the circuit and report a train having passed, the dispatcher noting the same on his train sheet; and should the called station take down the receiver to answer, before the first party has completed his business with the dispatcher he will and does wait and at the first opportunity give his station name as an answer to the call from the dispatcher.

This ability to utilize the full time of the line circuit in transacting business without interruption, while calling other stations, is one of the very best arguments for the telephone; and where the operators are experienced there is no difficulty found by reason of breaking in, as a finer line of courtesy and general deportment is developed where men can actually hear and recognize the speaker's voice than was ever known on the cold metallic click of the Morse circuit.

Modern telephone circuits for train dispatching are equipped with a ringing generator at each station and a bell at the dispatcher's station, this bell being automatically connected to the line when the dispatcher leaves his position, thereby providing a means for calling the dispatcher's office.

Under date of January 23, 1911, the Wichita *Beacon* published a comparison of the merits of the Telephone against the Telegraph for train dispatching, describing certain features of the telephone service in such a way as to be amusing to an experienced telephone train dispatcher, were it not quite so prominently displayed throughout that the arguments were all based on the assumption that the way station operators were working against instead of for their employers.

It is not fair to the way station operators to base any comparison of service upon their ability to avoid the performance of their duties. When the true basis of loyalty and ability quickly and effectively to do their duty in assisting the train dispatcher is used in comparing the telephone with the telegraph, the telephone stands out as far ahead of the telegraph as does the modern printing press ahead of the old Washington hand press.

The inventors and promoters of all modern machines and methods must meet the skeptic who, through inability to reconcile himself to the new conditions or for political reasons, will not gracefully accept the improvements over the "old time methods."

Installation Completed on N. Y. C. "Old Road"

The past month witnessed a decided innovation in the methods of train dispatching on the Old Road, as that part of the New York Central lines between Rochester and Syracuse via Auburn, is called, the new telephone system recently installed being now in service. The major part of the issuing of dispatches which has hitherto been possible only through the telegraphic service, will be performed over telephone. The telephone service is far more adaptable and has the further recommendation of greater speed. Superintendent F. E. McCormack, of the Rochester division, in discussing the new installation which is entirely within the territory of the Rochester division, gave it as his opinion that eventually the telephone will entirely succeed the telegraph as applied to train dispatching and general train operation.

In preparation for the new service, which has been under way for several months, copper circuits have been strung between Rochester and Syracuse and the required office conections been made at terminals and into stations along the route. In addition to the service into the telegraph offices which have hitherto afforded the only means of communication for the train dispatcher, the circuit is extended to the station master's office, round house and yard master's office, thereby making it readily possible to reach these points to the facilitating of general train operation. Hitherto these offices have been reached only through special messenger or over public telephone lines, which for the type of service demanded in railroad service, are not entirely adaptable.

With the new installations, it now becomes entirely convenient to call any particular operator on the circuit from the train dispatcher's office, the selector device being employed, which in effect is not entirely different from the switch boards used in the ordinary telephone exchange, which permit the calling of individual patrons. Not only can the train dispatcher thus call the particular offices, but he can hear the bell ring in the office called, thereby effectually ringing

the death knell to the time honored excuse of delinquent operators, "No call came in for me."

Train dispatcher and operators are each provided with a telephone receiver with head piece, similar to that employed by telephone operators. And it is readily to be appreciated how much more flexible is the telephone system, permitting of conversation between the dispatcher and operators along the line, than is the much more rigid Morse system of communicating through dispatches. By the new telephone system, a question is easily asked as though the one interrogated were in speaking distance of the dispatcher, thereby affording information about the movement of trains or matters in general, entirely impossible by telegraphy. It is also as easily possible to talk directly with conductors or engineers when desirable at stations along the line as by the proxy of operators under the old system.

At the smaller stations, where no night operator is employed, telephone booths have been placed, and conductors are able to call up the train dispatcher's office, which as is readily understood becomes exceedingly desirable at times.

Perhaps the most interesting feature of the whole system is the installation of a receiver and transmitter on the wrecking car. The device is furnished with apparatus for connecting into the telephone circuits, wherever the car may be located, thereby making it possible to take orders directly from the train dispatcher. The fact that the telephone circuit connects with the division superintendent's office enables that official to issue orders and receive information with a minimum of delay. The Canandaigua-North Tonawanda line of the Central, sometimes facetiously called the "Peanut Branch," has also been provided with a telephone system.

A Study of Telegraphic Transmission

By Frank F. Fowle*

VI. PHYSICAL PROPERTIES OF LINE WIRE.

THE properties of line wire will be discussed briefly, with special reference to the properties of copper-clad steel wires and the method of manufacturing this product.

Iron and Steel.—Iron and steel telegraph wires are commonly produced in three grades known as "Extra Best Best," "Best Best" and "Steel." The properties of wire vary from the properties of the metal very greatly in some cases, depending upon the amount of drawing and annealing.

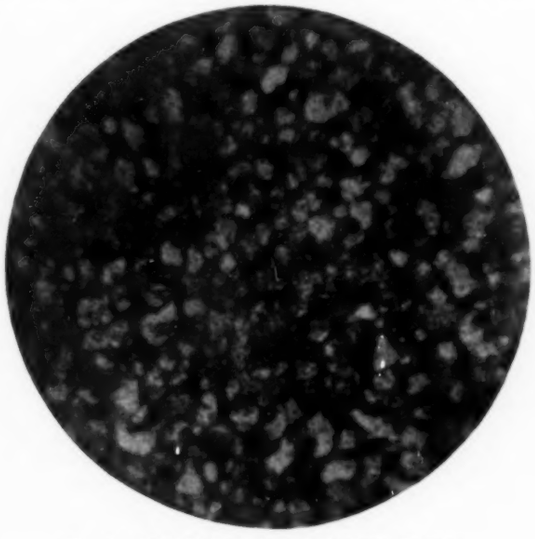


Fig. 6. Bare Steel, ⅜-inch Rod, Cross Sectoin.

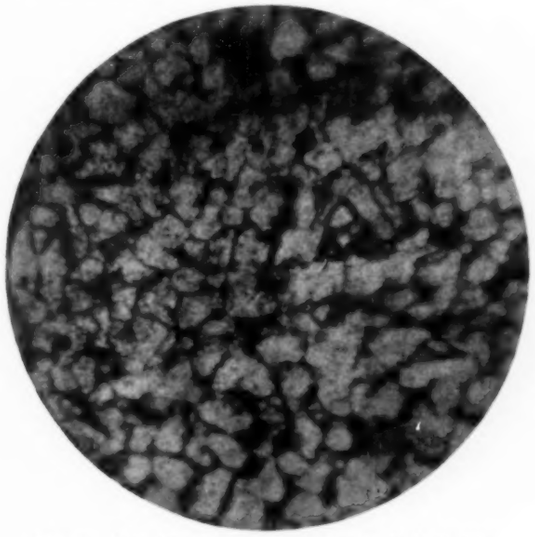


Fig. 7. Bare Steel, ⅜-inch Rod, Longitudinal Section.

The best quality of wrought iron has a tensile strength varying from 40,000 to 60,000 pounds per square inch, an elastic limit of about 60 per cent and a modulus of 28,000,000. When stressed to the breaking point it should elongate from 15 per cent to 25 per cent. In order to obtain the maximum conductivity with iron, it is necessary to use the purest grades, and formerly Norway or Swedish iron was employed almost exclusively. The purest iron in wire form has a tensile strength of about 45,000 pounds per square inch and a total elongation of about 15 per cent. Iron wire of E.B.B. grade is usually manufactured from a high commercial grade of wrought iron; its tensile strength is usually over 50,000 pounds.

The grade known as B.B. iron is manufactured from mild steel, of about .15 per cent carbon. Steel of this character has a tensile strength of about 60,000 pounds, an elastic limit of 50 per cent to 60 per cent, a modulus of 28,000,000 and a total elongation of about 25 per cent. The wire is higher in tensile strength and lower in conductivity than E.B.B. iron.

The grade known as "Steel" is manufactured from

*A report on the use of copper, iron, and copper-clad steel wires in telegraph service, made to Frank R. Chambers, Jr., vice-president of the Duplex Metals Company, August 1, 1910. Continued from the March numebr of TELEPHONE ENGINEER.

steel of substantially the same amount of carbon as given before, but it has slightly greater tensile strength. Steel in general becomes stronger and less ductile as the proportion of carbon increases, and at the same time its conductivity diminishes. The process of wire drawing, without annealing, will produce in the smaller sizes a tensile strength of from 250,000 to 300,000 pounds per square inch. But high tensile strength is obtained at the sacrifice of conductivity. By manipulation of the amount of carbon, the amount of drawing and annealing, the properties of steel wires can be varied to a large extent. The properties of iron and steel telegraph wires may be summarized, as follows:

Grade of Wire	Tensile Strength	Elastic Limit	Modulus of Elasticity
E. B. B.	53,000	55% to 60%	28,000,000
B. B.	58,000	"	28,000,000
Steel	65,000	"	28,000,000

The tensile strengths given in the table are those stated by Roebling. The grade of wire most used in telegraph service is B. B. iron. All of these wires are galvanized to prevent corrosion. As a matter of fact the corrosion is not prevented, but delayed. The best known grades of wrought iron, which came from Sweden and Norway, produced wires that had a long life, of from 30 to 40 years under the best conditions. But the iron and steel wires now produced do not give as long a life, due partly to the greater presence now of smoke and dirt from soft coal, and partly to the use of inferior metals.

Copper.—Soft annealed copper has a low tensile strength and is not suitable for suspended wires. The process of cold drawing hardens and strengthens the metal, so that telegraph wire manufactured in this way has a tensile strength of approximately 60,000 pounds, an elastic limit of 60 per cent and a modulus of elasticity of 16,000,000 to 17,000,000. The copper must be as pure commercially as it can be made and electrolytic copper is generally used. Hard drawn copper is not as ductile as iron or low-carbon steel; its ultimate elongation is about 1.5 per cent to 2 per cent. The tensile strength increases with the amount of drawing, somewhat, but the value given is safe for telegraph sizes and it may exceed 65,000 pounds for the smaller sizes.

Hard drawn copper possesses, however, the property of stretching to a considerable degree when subjected to high stresses for comparatively long periods. In other words, the properties of such wire are not independent of the time during which the stress is applied. The properties stated above are those determined from tests made in the usual way, in comparatively short periods. It is not yet possible to state exactly how the time element alters these properties.

Copper-Clad Steel.—Copper-clad steel wire is bench drawn from rods with the same machines used for drawing ordinary wire. The rods are rolled from billets and the latter are made by means of a special process which will be described briefly. The copper used in the process is electrolytic copper, which is inspected and tested to reveal flaws and imperfections and the presence of impurities, including sulphur, antimony, arsenic and iron. The steel used is made by the Basic Open Health process, and contains about .15 per cent carbon, .30 per cent manganese, not more than .035 per cent sulphur and phosphorus and a trace of silicon. Tests on samples from the steel blooms show a tensile strength of 51,000 pounds, an elastic limit of 50 per cent and a total elongation of 25 per cent.

The blooms are hot rolled into suitable sizes for making copper-clad billets, about 26 inches long and 5 inches in diameter. The billet is passed to a machine where the ends are drilled and tapped to facilitate handling. Then it is placed in a pickling solution and afterwards preheated for the coating process. The billet is next arranged in a cylindrical mold, out of the lower end of which it can be lowered for the dipping treatment. The mold and billet are taken to a special furnace which contains specially prepared copper in a molten state, at high temperature. The billet is then lowered into the furnace and allowed to remain long enough to form a surface alloy of copper. The billet is drawn up into the mold and then the whole is lowered into a second furnace, containing pure molten copper, until the mold fills. When the copper has set, the finished billet of copper-clad steel is pushed out of the mold. After a preliminary heat treatment it is hot rolled to wire bars. The two metals, notwithstanding their different physical properties, flow practically as one in the rolling and drawing process, and the proportional areas of copper and steel remain substantially constant from the billet to finished wire.

The properties of the finished product are remarkable. The following tests were made by Messrs. Booth, Garrett & Blair, Analytical and Engineering Chemists, of Philadelphia. Test No. 1 is on a copper-clad steel rod, annealed, .375 inch diameter; No. 2 is on a bare steel rod, annealed, .375 inch diameter, of the same quality as that used in the core of No. 1; No. 3 is on a copper-clad rod, with the copper turned off, .367 inch diameter of steel.

Fig. 8. Structure of Steel, Copper-Clad Rod ¾-inch Cross Section.

Test.	Tensile Strength.	Elastic Limit.	Total Elongation.
No. 1	51,680 lbs.	89.1%	35.0%
No. 2	54,540 lbs.	82.0	39.5
No. 3	61,520 lbs.	89.2	22.0

The first test shows the very high elastic limit of copper-clad steel. The second shows the corresponding elastic limit of the same quality of bare steel as

that used in the core, which is less. The third shows the rolling of the steel in a copper jacket has increased both the tensile strength and the elastic limit over steel rolled in the ordinary way.

A series of tests described in the paper on "Copper-Clad Steel" by Mr. Wirt Tassin, before the American Society of Testing Materials, in June, 1910, give corroborative results. Test No. 1 was made on a copper-clad steel rod, annealed, .375 inch diameter; test

Fig. 9. Copper-Clad Steel, ¾-inch Rod, Longitudinal Section.

No. 2 was made on a bare steel rod, annealed, .375 inch diameter and the steel in each case came from the same heat.

Test.	Tensile Strength.	Elastic Limit.
No. 1	52,980 lbs.	85.1%
No. 2	53,870 lbs.	76.3

Test No. 1 as above compares with No. 1 in the previous table, and No. 2 above compares with No. 2 in the previous figure, showing close agreement. The slightly lower elastic limits in the tests as above may be due to difference in annealing.

The catalogue properties of the wire show a tensile strength from 93,000 pounds per square inch for No. 9 B. & S. gauge to 99,500 pounds for No. 14, and 90 per cent elastic limit. I made tensile tests of No. 12, No. 14 and No. 17 B. & S. gauge wires, which showed breaking weights always in excess of the catalogue values, by safe margins.

The weld may be tested by various kinds of stress, by hammering and by suddenly cooling a red hot wire. I broke samples of wire by tension, torsion and bending, without separating the copper from the steel or producing anything but a clean fracture. Heating a wire to a read heat and plunging it into cold water, repeated five times, produced no separation. A sample was gripped in a vice and the end hammered down until it spread considerably, without opening the weld. I was only successful in separating the copper by melting it off in a blow flame. These tests subjected the material to far more severe stresses than it receives in ordinary service.

Investigations of the possible existence of a corrosive action at the junction of the metals do not reveal any such action, although it is well known to take place in copper-coated steel wires, unwelded, in the presence of moisture. Copper and steel in contact, with moisture present, form a couple and galvanic action causes rapid corrosion. In copper-clad steel there is in fact no abrupt junction of the metals, but a series of graduated alloys whose properties range between the limits of copper and steel, with various intermediate combinations. These appear under the microscope as an alloy film, between the metals. The presence of these alloys and the absence of any space between the metals to hold moisture, seem to account for the immunity from corrosion along the weld. The corrosion of the steel area at exposed ends, so far as it exists, appears to cease after a brief period of exposure. The tests conducted by Mr. C. C. Rosenberg, consulting signal engineer, of Bethlehem, Pa., show that with samples immersed in fresh or salt water, the end corrosion ceases after a period of 15 to 40 days. These facts should dissipate any fears, sometimes entertained, that the entire steel core would corrode, in a wire perhaps of great length, and thus render it worthless from a service standpoint. No experience of which I can learn justifies this view.

The modulus of elasticity is naturally neither that of steel nor copper, because the modulus of the former exceeds that of the latter. Upon the assumption that it will be a mean between the two, it will have a value of about 25,000,000. The investigations thus far conducted show, however, that it is about 20,000,000. A low modulus has an advantage shown by inspection of expression (104), in the respect that it permits of greater elastic stretching or elongation up to the elastic limit, and consequently greater ability to relieve the tension in spans under loads of wind and sleet.

The superior properties of the steel in copper-clad steel wire appear to be due to a finer structure of the metal. Photomicrographs of longitudinal and transverse sections show very clearly the differences in structure between the steel of the core and bare steel treated in the same way. Figures 6, 7, 8 and 9 are reproductions of photomicrographs given by Mr. Tassin in his paper before referred to, all with magnifications of 150 diameters. The finer structure of the steel in the copper-clad rod is apparent.

Summary.—The following comparative summary shows the properties of wire of B. B. iron, hard drawn copper and copper-clad steel:

Material.	Tensile Strength.	Elastic Limit.	Modulus of Elasticity.	Coefficient of Expansion.
B. B. Iron	58,000	60%	28,000,000	.000,0061 (F)
H. D. Copper	60,000	60%	17,000,000	.000,0096
C. C. Steel	95,000	89%	20,000,000	

The total elongations up to the elastic limit and up to the breaking point compare as follows:

Material.	Elongation up to the Elastic Limit.	Elongation At Rupture.
B. B. Iron	.124%	15%
H. D. Copper	.212%	1.5 to 2.0%
C. C. Steel	.423%	1.5 to 2.0%

The superiority of copper-clad steel wire is apparent from these tables. It possesses two-thirds more tensile strength than B. B. iron or hard drawn copper, and double the amount of elastic stretching, up to the elastic limit, that copper possesses. It will therefore sustain much greater loads of wind and sleet than the same size of iron or copper.

(To be continued.)

Portable Telephone Sets

With the spread of telephone train dispatching among the railroads in this country, a piece of apparatus has come into extensive use on such lines, and every day sees its adoption to a greater extent. This is the portable telephone set.

This set is being used by officials in their private

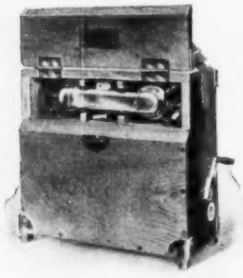


Fig. 1. No. 1330 Set, with Powerful Five-Bar Generator.

Fig. 2. No. 1331 Set, with Leather Case, Closed.

cars, inspectors who have to cover the line, train crews and construction, bridge and wrecking gangs.

The advantages of the portable telephone set are striking. Communication can be established immediately between a distant point and headquarters by means of such a set carried on trains, and connected to the telephone train wires by means of a line pole. In cases of emergency, this one feature has more than paid for the total cost of the installation of the telephone circuit. Delays to traffic are reckoned in dollars and cents, and on important lines, such delays are tremendously expensive. With a telephone at hand, and the conductor or some one else able to give headquarters detailed advice in regard to conditions on the spot, hours are frequently saved.

Three of the sets in general use among the railroads are those manufactured by the Western Electric Company and known as the Nos. 1330, 1331 and 1332 types. The first named is equipped with a powerful five-bar generator and finished with a special weatherproofed varnish. The construction is of the strongest

Fig. 3. No. 1332, a Small and Light Talking Set in Leather Case.

throughout, and the corners are reinforced with steel. The hand set in this particular case is attached to a six-foot cord so that the user may stand upright when the set is on the ground, and a push-button is provided in this hand set so that the transmitter circuit is closed only when desired. The No. 1331 set is of similar design, but equipped with a three-bar generator. The No. 1332 set is for use on train wires, where the dispatcher is at all times connected with the circuit and it has no generator.

Many of the roads are equipping every train on their line with these sets, and their use on wreckers is very general. In some cases, the portable telephone set is made part of the standard equipment of the engine.

On the Seaboard Air Line some of the conductors recently petitioned to be allowed to purchase these sets for their own use, out of their own pockets, so greatly did they appreciate the advantages of such apparatus in times of emergency.

M. K. & T. Telephone Plans

The Missouri, Kansas & Texas railroad has ordered material to construct telephone lines from Denison south to Hillsboro via Fort Worth, from Denison to Hillsboro via Dallas, and from Hillsboro to Smithville, also along the Dallas and Denton branch. Copper wire will be used weighing 210 pounds to the mile. This telephone system will be for dispatching trains, but will not displace the telegraph service now in use. No telegraph operators will be thrown out of work. The telegraph wires will be used for company messages, while the telephones will be used almost exclusively for dispatching trains. Work will begin within thirty days, and it is expected that 674 miles will be completed by the time the fall business begins.

In addition to the telephone lines, more than 2,000 miles of additional telegraph line will be strung, most of it in Texas.

Use of the telephone will enable the company to operate its freight trains with great speed. Boxes will be located at sidings, where the trainmen can plug in and talk directly with the dispatcher.

The proposed improvement was announced by W. H. Hall, superintendent of telegraph.

Northern Electric Tries Telephones

To determine if telephones can be used instead of telegraph for the dispatching of its trains is the object of an experiment to be tried on the Northern Electric Railway at Butte, Cal., and the results of the experiment will be of importance to electric railroad companies throughout the west.

On steam roads the telephone has supplanted the telegraph with success, according to distance, but some of the electric roads have to overcome a difficulty with which steam roads do not have to contend. The telephone wires for service in dispatching trains on electric roads must be strung along the right of way, and in comparatively close position to high tension power cables. As the high voltage wires carry sometimes 30,000 volts, they tend to create disturbances on the telephone wires, rendering the telephone practically useless.

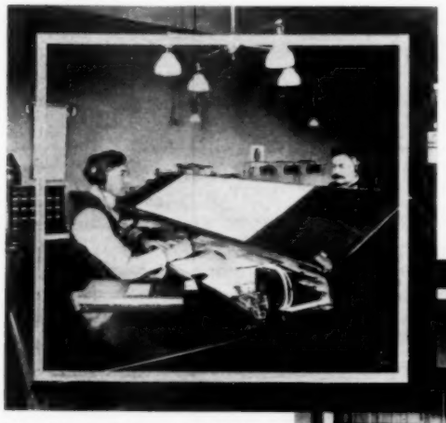
To overcome this difficulty the Northern Electric is stringing a specially prepared wire to avoid induction by the high voltage wires. It is expected that the new telephone system will be ready for trial in a few months, and, if successful, will result in smaller dispatching expenses.

Telephones on the Pennsylvania Lines

By Charles L. Mulligan

THE Pennsylvania Lines East may be classed among the leaders in the movement to adopt telephone standards of dispatching trains. More than 1,700 miles, or about one-third of the entire road, are now equipped with telephone apparatus. The installation of the new equipment on this road has been done with attention to every detail, and the dispatching system is considered among the most thorough and efficient now in operation.

Telephone equipment is now in successful operation over two sections of what is known as the Grand Eastern division. These are the Philadelphia division, from Philadelphia to Harrisburg, and the Middle division, from Harrisburg to Altoona. The telephone is now being used for dispatching, message and blocking work between these points.



Dispatcher's Office at Harrisburg.

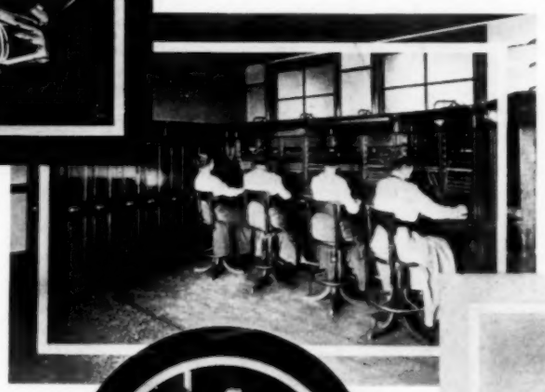
In the Philadelphia division, which is 104 miles in length, there are fifty-seven way stations equipped with telephones and selectors of Western Electric manufacture. Between Harrisburg and Altoona, 131 miles, including branches, the number of way stations equipped with telephones is about seventy-five. Between the latter two points there are four train wires and two message wires.

Since the telegraph has been almost entirely done away with on these divisions, it has been necessary to send time out on the telephone wires. This is being done on some of the wires between Harrisburg and Philadelphia. The system in use is one that has been recently developed by the Western Electric Company. It consists essentially of the installation at each way station of 1,000 ohm ringers in series with the selector, and at the dispatcher's office a transformer is arranged so that the telegraph relay which receives the time makes and breaks the primary. This causes alternating kicks to be generated in the secondary which operate all the time bells, reproducing the taps which were formerly heard on the sounder.

The telephone equipment of the Middle division is well worthy of comment. The use of the Morse key has been entirely wiped out at every one of the way station towers, and the only telegraph business done consists of through messages. Besides the four train wires there are two message circuits of 35 and 20 stations.

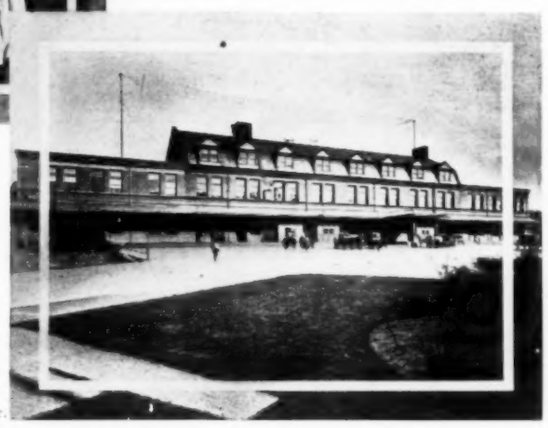
On this division there are in use interrupters at each of the block towers which are used for signaling on all the lines which radiate from the tower which require code ringing. The interrupters are operated by push buttons which close the local battery and send alternating current on the line. The instrument is very efficient, five cells of battery being sufficient to operate twenty 2,500-ohm bells on a 500-ohm line. This piece of apparatus is shown in the accompanying cut. The Pennsylvania road was the first to use this type of interrupter and it has found that by its use the operators save both time and energy in ringing on the lines.

A Western Electric No. 10 switchboard, with four positions, connected with the lines of the Bell Telephone Company of Pennsylvania, handles the local telephone work at Harrisburg. Extensions from this central switchboard reach all the offices and departments in the big station at Harrisburg and the residences in that city of many of the railroad officials and employes. Trunk lines from this board go to Altoona and Philadelphia and to small switchboards located at important points both east and west on the railway's telephone system. A unique use of this service is made in the train shed at Harrisburg, where an usher announces trains when notified over the telephone by the station master.



Switchboard in Harrisburg Railroad Exchange.

Usher Receiving Train Report.



Harrisburg Station Showing Wireless Aerial.

Altoona is a great railroad city. Here the Pennsylvania exchange consists of a completely equipped

No. 1 switchboard. The fact that over 4,000 trunk calls were recorded every twenty-four hours recently led to an order for the equipment of additional trunk facilities for the Altoona exchange.

Here in Altoona the system of calling employees to duty is in vogue. When a train is made up the railroad sees to it that each member of the train crew is notified in plenty of time, so that he may be at his post ready for the start. There is a continuous movement of freight and passenger trains in every direction, so this, it can easily be seen, is a complicated task. Formerly it occasioned the employment of many messenger boys. Today each railroad man has a telephone instrument in his home. All of the calling is now done by telephone. The introduction of this service has effected a great economy of time and expense in this direction.

The station at Harrisburg as well as the one at Altoona is equipped with a No. 3 toll test board. This is the newest and most improved testing mechanism known, and its use permits quick and accurate tests over both telephone and telegraph circuits of the railway's dispatching and message system.

Each way station is equipped with a special switchboard of the Pennsylvania Railroad Company's own design. This board contains ten combined jacks and signals, which are equipped with local contacts for code ringing. Two telephone sets are placed in each way station tower, one mounted on a special transmitter arm, the other an emergency desk stand telephone with head receiver.

The installation of a complete telephone train dispatching equipment within the Philadelphia terminal of the Pennsy was recently described in this department. This is believed to be the first installation of a complete telephone dispatching system within the limits of a terminal.

Manufacturers Exhibit at Railway Convention

The twelfth annual convention of the American Railway Engineering and Maintenance of Way Association was held in Chicago March 21 to 23. The program for the convention included the reports of standing and special committees.

In connection with the convention there was held in the Chicago Coliseum during the week beginning March 20 an exhibit of railway appliances used in the construction, maintenance and operation of American railways. Among the exhibits of interest to telephone men were those of the following manufacturers:

American Steel & Wire Company, Chicago, fencing, gates, signal wire, rail bonds, etc. J. M. Holloway, L. P. Shanahan, S. F. Deems, H. A. Parks, B. H. Rider, H. S. Durant, C. S. Knight were present.

Bryant Zinc Company, Chicago and New York City, signal and battery supplies, fibre conduit, Gould storage batteries, crossing bells, battery vaults and chutes, electrical instruments, track and linemen's tools. A. F. Klink, E. M. Deems, R. N. Baker, Stanley Bryant, H. J. Hovey, R. N. Chamberlain, J. W. Cremerius were in attendance.

Duplex Metals Company, New York, a miniature pole line showing results of sleet storm; samples of copper-clad steel wire and products, nails, cotter pins and bolts. Frank R. Chambers, Jr., W. T. Kyle, G. P. Fondersmith, W. W. Lampkin, E. M. Fondersmith were in charge

Edison Manufacturing Company, Orange, N. J., primary batteries, automatic block signals, crossing bells, telephone circuits and gas engine ignition. E. E. Hudson, E. J. Lepreau, E. W. Brown, P. A. Garrity represented the company.

Electric Storage Battery Company, Chicago, Chloride Accumulator batteries for car lighting, electric interlocking plants, automatic block signal work, small lighting plants, telephone and telegraph service. G. H. Atkin, T. Milton, R. E. Baird and T. A. Cressey were present.

Hubbard and Company, Pittsburg, Pierce galvanized steel brackets for telephone, telegraph, electric light and railway telephone and telegraph lines, pole line material, Hubbard shovels, sledges, hammers and various tools used in track laying and maintenance. Represented by C. L. Peirce, Jr., R. L. Mason, J. A. McLaughlin, B. S. Handwork and Albert Pack.

Kellogg Switchboard & Supply Company, Chicago, railway telephone equipment, train dispatching sets, various types of portable telephones, siding telephones and ordinary telephones for use on both steam and electric roads. Intercommunicating sets, composite telephones, insulated telephones.

Kerite Insulated Wire & Cable Company, New York, Kerite insulated wires and cables. R. D. Brixey, Azel Ames, P. W. Miller, J. A. Renton, J. V. Watson, B. L. Winchell, Jr., E. B. Price were in attendance.

W. N. Matthews & Brother, St. Louis, Matthews' guy anchors, cable clamps, cable-splicing joints, lamp guards, guy clamps. Claude L. Matthews, W. N. Matthews, Victor L. Crawford, Walter E. Bischoff, A. P. Eckert attended.

Okonite Company, New York, Okonite wires; aerial, underground and submarine cables for all kinds and conditions of electrical service; potheads; cable joints; Okonite and Manson tapes. J. S. Langan, L. G. Martin, J. M. Lorenz, H. M. Cox, and C. E. Kacin attended.

Standard Underground Cable Company, Chicago, bare and insulated copper and copper-clad wires. Represented by H. P. Kimball, R. G. Harris, E. J. Pietzcker, Russell E. Green, B. S. Stewart.

United States Electric Company, New York and Chicago, Gill selectors, railway signals and electrical devices. Represented by M. E. Launbranch, W. L. Cook, E. E. Backus.

Western Electric Company, New York and Chicago, railway telephones for train dispatching, siding telephones, portable telephones for train crews and all telephone apparatus, fan motors, arc lamps, installation material; Buffalo grips, Mazda lamps, bells and buzzers. G. H. Porter, D. C. Guest, M. A. Oberlander, G. K. Heyer, W. H. Doherty, H. L. Grant were present.

Copper Clad Wire for Dispatching Circuits

A book recently issued by the Duplex Metals Company and mentioned in our Trade section, gives the following data under the heading, "Telephone Train Dispatching":

When telephone train dispatching was first considered by the railroads of this country, it was thought that wire of high conductivity was required and a great deal of No. 9 copper was used. After a long investigation, one of the engineers of the Duplex Metals Company designed a new station connection on the principle that while in ordinary telephone work the problem was one of transmission—in telephone train dispatching the problem was one of distribution. The result can best be given by comparing the performance of a No. 10 copper-clad and a

No. 9 copper wire which were strung parallel on the Burlington Railroad.

Before the change in station connections was made, it was considered dangerous to try to give orders to more than seven stations at one time over the No. 9 copper wire. After the change was made, orders were satisfactorily given to twenty-one stations at one time over the No. 10 copper-clad.

Aside from the saving in first cost obtained by substituting copper-clad for copper, the great advantage in the use of copper-clad is the stability of the line. We believe there is no case on record where No. 9 copper-clad wire ever broke under weather conditions only, and we do know that on the Great Northern lines, when the galvanized and copper lines are down, trains are still dispatched over the copper-clad wire.

More particularly while construction work is under way portable telephone sets are very frequently used, and in order to get a good contact copper wire is very often nicked, and this means in the course of a short time a break in the wire. Nicks do not affect copper-clad.

There is today over 12,000 miles of copper-clad in use for telephone train dispatching.

The Meeting at St. Louis

The Western Division of the Association of Railway Telegraph Superintendents held its regular quarterly meeting at the Southern Hotel, St. Louis, with E. A. Chenery, superintendent of telegraph of the Missouri Pacific, in the chair. The greater part of the time was taken up in the discussion of matters pertaining to the operation and maintenance of telegraph and telephone systems. W. C Walstrum, superintendent of telegraph of the Norfolk and Western Railroad, Roanoke, Va., was chosen chairman of the committee appointed to arrange for the attendance of the Western Division at the annual meeting to be held in Boston June 19 to 23. Mr. Chenery stated that 35,000 miles of railroad had been equipped with telephones for train dispatching and there still remained 240,000 miles to be supplied. The members and guests were entertained at luncheon by the supply men and were given a banquet at the Jefferson Hotel by M. T. Cook, division commercial superintendent of the Western Union Telegraph Company.

Selective Train Order Signaling

The United States Electric Company has issued bulletin No. 701, "Some Preventable Accidents," in which three of the collisions reported in the latest train accident bulletin of the Interstate Commerce Commission are studied and shown to be preventable with apparatus now available to the railways. This company's system provides, in brief, for the absolute control, by the dispatcher, of any semaphore or train-order board which he may throw to the stop position, independent of the presence of local attendance. The signal when so thrown reports itself audibly to the dispatcher and cannot be set back in the safety or proceed position until electrical permission to do so has been given by the dispatcher, although the dispatcher may clear the signal without the intervention of the train crew or agent. The system, as described would seem to be adequate for the prevention of the three collisions mentioned, if it had been available, and of similar accidents under ordinary conditions of operation.

Of Interest to the Trade

By A. L. Haase

Book Reviews

Cyclopedia of Telephony and Telegraphy.—These sumptuous volumes seem to be designed mainly for the use of the semi-technical man—the man who is not schooled in the more advanced methods of technical education. They have been written "down," so to speak, and by this we mean to imply nothing of disparagement. The information has been conveyed in simple terms, with a wealth of practical illustrations and a minimum of pure theory. Mathematics are conspicuous by their comparative absence. The style in general is such as the person of average education could comprehend with ease, and the books will doubtless prove helpful in thousands of cases where a more pretensious offering would fail of its purpose.

Having set up a standard of practicality, the various authors, editors and collaborators have followed it with admirable devotion. The language is simple, the exposition clear, and difficult points have been attacked in a concrete manner with specific illustrations and references to actual practice. The pictures and diagrams are exceptional in their abundance and admirable workmanship.

The first two volumes and about half of the third are devoted to Telephony under the authorship of such prominent experts as Kempster B. Miller and Samuel G. McMeen. Fundamental principles, substation equipment, party-line systems, protection, manual switchboards, automatic systems, power plants and buildings, special service features, telegraph and railway work, line construction, engineering and maintenance—all these divisions of the subject are handled with great detail and completeness. A chapter on Electrical Measurements by George W. Patterson, and a chapter on Storage Batteries by F. B. Crocker and M. Arendt, complete volume three.

Volume four opens with the Electric Telegraph, by Chas. Thom. Turning through this meager hundred pages one feels that the space allotted to such a large subject is scarcely adequate; but a closer scrutiny of the text gives assurance that no salient feature has been neglected. Next comes an able treatment of Wireless Telephony and Telegraphy, by Charles G. Ashley. There is nothing but admiration for the neat manner in which the author has packed his ideas into these pages. The very difficult theoretical basis of the subject has received an exposition that is at once lucid and concise. Elements of Electricity by R. A. Millikan—a treatise on the properties of electricity and magnetism, particularly in their relation to telephone and telegraph circuits—comes next in order; and then a chapter on the Electric Current, by L. K. Sager. Two short chapters on the Telautograph, and the Telegraphone, the former by James Dixon and the latter by A. F. Collins, complete the fourth volume, which is the last.

At the end of each volume is found a compilation of review questions covering all the matter contained

in the preceding pages. These questions will be of great help to all who read the books with serious intent. At the end of volume four is a general index affording ready reference to any subject covered by the entire work. In the make-up the volumes impress one with their substantiality, and their bright red leather bindings with gold lettering will add an attractive touch of color to any bookcase. There is a host of workers in the telephone and telegraph field who will find this cyclopedia a valuable acquisition to their mental equipment.

Published by the American School of Correspondence, 4 vols., bound in half morocco. Price, $12.80.

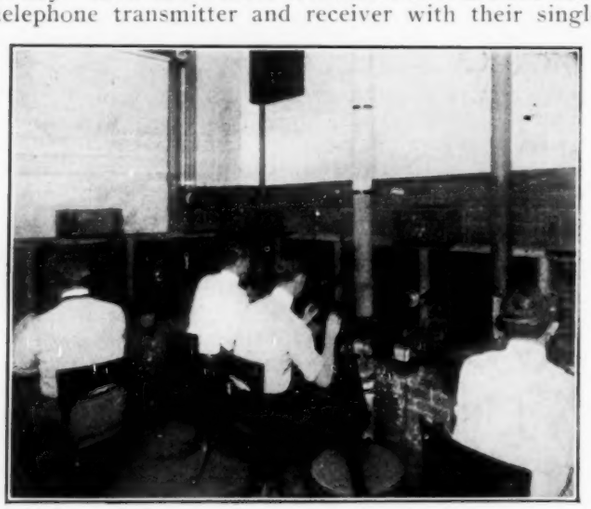
Transmitters and Receivers in the Making

Fifteen hundred tons of brass, three hundred tons of steel and at least two hundred tons of rubber and other raw materials, including thirty-five million screws, were consumed last year in the manufacture of Western Electric transmitters and receivers.

All of this apparatus is made in the big factory fronting on West street, New York City, which ranks second only to the immense Hawthorne works of the same company. Some idea of the magnitude of this branch of the telephone making industry may be had from the statement that over one million pair of transmitters and receivers were manufactured during 1910.

The manufacture, inspection and testing of these instruments forms an interesting story, and the accompanying illustrations show some of the processes involved.

The average telephone user gives very little thought to the why and wherefore of the transmitter and receiver. He thinks of the telephone as a national and personal convenience, but seldom has any conception of what the instrument really is. To get the wide range of notes from a stringed musical instrument a large number of vibrating strings are necessary. How much more wonderful then are the little telephone transmitter and receiver with their single



Receiving End of Transmitter Test.

vibrating diaphragm. These instruments receive and transmit the human voice over miles of wire under a multitude of conditions. Not only will they transmit and receive the comparatively few notes of a piano, but they will reproduce the individual characteristics of the human voice over great distances.

THE TRANSMITTER.

The transmitter is one of the most delicate pieces of apparatus on the commercial market. Several of its parts must be held to such close dimensions that the Western Electric Company was confronted with the problem of making not only the telephone instruments but much of the necessary testing apparatus and

Final Assembly of Receivers.

measuring instruments. Such instruments as those used to measure the thickness of the mica, which is held to within three ten-thousandths of an inch, were made in the company's own shops. It is interesting to note that in order to secure mica that can be cleaved to such small dimensions it is found necessary to import it from India and that because of the difficulty met with in separating even this selected mica into exactly the right dimensions fully 80 per cent is rejected.

Another important operation is the manufacture of the carbon granules contained in the transmitter button. These granules must have exactly the right degree of hardness, otherwise the tone of the transmitter will be affected. They must be of uniform size, otherwise the transmitted would have a tendency to pack, and, in addition, just the right amount of carbon granules must be used. The carbon is measured in a cup having a steel cut-off, which insures the correct volume. In order to see that the carbon is running with right ratio of weight to volume a certain percentage of the buttons are weighed by means of a delicate balance and a close check is kept on them.

The front and back electrodes are also made of carbon. Each is as highly polished as a steel mirror and each one must have just the proper degree of hardness, otherwise pitting would result from the passing currents, which would affect the transmission and might result in packing.

TESTING.

In testing most telephone apparatus, such as generators, drops, relays, etc., it is possible to measure their efficiency in concrete terms and with practically no human factor entering into the results of the tests. Since the primary function of a transmitter is to transmit the human voice, it becomes necessary in testing their efficiency to make use of the human voice, and thus the human element enters. The volume and articulation test is made over a circuit line which is

the equivalent of an actual line two hundred miles in length. The operator standing at the receiving end signals back to the man testing the transmitter, telling him whether the volume and the articulation is satisfactory. In order to eliminate carelessness as far as possible from this test the inspectors do the talking and receiving in pairs. In the morning one does the talking while the other is receiving, and in the afternoon the operation is reversed. By long training at this work these men are able to pick out a variation in efficiency to a fraction of one per cent. Any transmitter that does not measure to the standard transmitter must go back for readjustment.

Besides the transmission test, the transmitters must also survive what is known as the mechanical inspection, which includes a minute, detailed inspection of every one of the piece parts going to make up a section of the instrument, each group of parts as assembled, and finally the completed instrument.

THE RECEIVER.

The received is another delicate piece of electrical apparatus and successfully to manufacture it requires special machinery and skilled labor. The steel from which the magnets are made must be carefully chosen and then comes the proper tempering and magnetizing of it. Formerly skilled men were employed to deter-

Final Assembly of Transmitters.

mine when the steel was heated to just the proper temperature for emersion, but after years of experiment a way was devised and placed into effect by which "human error" was eliminated. Today the temperature of the annealing furnaces is kept at a predetermined uniform heat by means of an electrical indicator. By placing the steel in the furnace for a prescribed time the exact conditions for producing the fine degree of temper are obtained.

Another important member of a receiver is the vibrating diaphragm, whose thickness must be held to within two thousandths of an inch. The space between the ends of the pole pieces and the diaphragm must be held to a dimension as close as .015 inch, for any greater dimension would decrease the efficiency of the receiver, and any less dimension would make the instrument so delicate that hard usage would put it out of commission.

The receivers are given the same rigid talking and mechanical tests as those given to the transmitters mentioned above. Maximum efficiency over the longest possible period of service both in the transmitter and receiver is the result of the pains taken by the company in the manufacture of this apparatus.

A Reversable Counter for "Peg Counts."

A counter, designed for use by telephone operating companies in making "peg counts," etc., is being marketed by the Standard Register Company, Chicago.

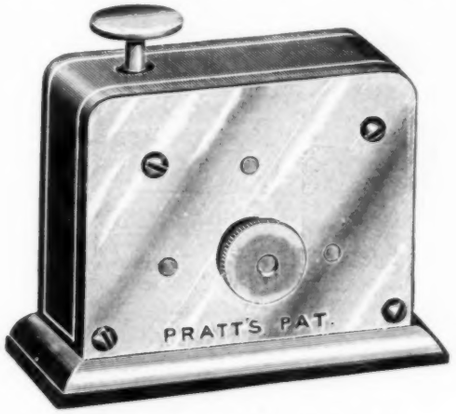
As a pole counter the instrument should prove

Front View of Standard Register.

especially valuable to the field gang and construction department. As a toll counter its value to the operator is unquestioned.

One particular feature of this counter is the fact that it can be reset, which is not true of the other style of counters at present on the market. This is accomplished by means of a button on the back of the instrument.

The operation of the device is simple, consisting of merely touching a protruding button on the top of the instrument. The action being positive, every touch, whether it be light or heavy, makes a record



Back View Showing Reverse Button.

and the registering can be done as fast as one can move a finger.

The machine is very light and compact, and is made of a fine grade of steel to resist wear—every part being specially die made for the particular func-

tion it performs, and is guaranteed not to get out of order.

The figures on the dials are of large size and are plainly to be read through a celluloid plate.

A neat circular describing the device will be sent to those interested by addressing the company, whose advertisement appears elsewhere in this publication.

Automatic Offers Prizes for Letters

In our advertising pages this month will be found a remarkable offer by the Automatic Electric Company's new supply department. The company is naturally of the opinion that its telephone cords and condensers are better than any others. Therefore it has posted a series of cash prizes for letters embodying the most convincing arguments showing the superiority of this product.

Attached to the advertisement is a coupon, which the aspirant for honors and cash emoluments in this contest may send to the company and receive a sample of the cord and the condenser specifications.

The contest is open to any one connected with an operating company, a telephone manufacturing company or a telephone supply company. Letters must be submitted on or before 12 o'clock noon, May 25, and prizes will be awarded by a committee of telephone men not connected with the company. The three prizes are respectively $100, $50 and $25.

The company is having great success with its supply department. With the first intimation to the trade of its entry into the cord business its total output for March delivery was sold, and the company has ordered twenty more machines for installation in its factory.

In connection with the part of the prize contest relating to condensers, it may be stated that the ordinary telephone condenser is still something of a mystery to many people. Those who are not yet entirely familiar with its uses and operation should read the article in this issue of TELEPHONE ENGINEER entitled "The Telephone Condenser and Its Uses." We are indebted to the staff of the Automatic Electric Company for this comprehensive and lucid exposition of condenser functions and properties, which should prove interesting to every telephone man. We have no apology to offer for placing this excellent material in our regular reading pages, for it is in no sense a trade article or write-up, and does not even suggest any particular type of apparatus. The company, indeed, is secure in the conviction that the mere act of awakening interest in good condensers will redound to its own advantage.

A Handbook of Copper Clad

The Duplex Metals Company, Chester, Pa., has issued the Copper-Clad Handbook, a sixty page book of the history, metallurgy and uses of copper-clad steel wire. The work is extremely interesting as a scientific treatise on this remarkable product, and aside from its trade value. The vicissitudes of experimenters in this attractive field before John Ferreol Monnot discovered the secret of its success are as absorbing as the history of the discovery of steam power, or any of the modern industrial triumphs. And the record of reports and investigations has a sincerity about it that is unusual in manufacturer's literature.

Attention is briefly called in the book to the patents which cover the process and product, and the company states its intention to enforce its rights under these patents.

The articles on the metallurgy of copper-clad, by Wirt Tarson, formerly assistant curator of the National Museum at Washington, D. C., is interestingly illustrated with halftones, showing sections of steel, copper-clad and galvanized wire.

The section of the book entitled "Telephone Applications" contains the following data:

For telephone work copper-clad will not absolutely displace copper.

For very long toll lines, copper is still the best material to be used, and for small wire in cable copper is still the best material. For open line distribution, however, copper-clad can be made to save money in either of two ways:

First, by using No. 14 copper-clad, instead of No. 12 copper, and so making a saving of 40 to 50 per cent in first cost with greater strength than is furnished by the copper.

Or, by using No. 12 copper-clad in place of No. 12 copper, a first cost saving of 10 or 15 per cent may be obtained with a reduction in maintenance cost of a least 75 per cent. There are cases on record where No. 12 copper-clad has stood up where No. 9 copper has broken.

In subscribers' connections, No. 17 copper-clad twisted pair not only shows a saving of 25 per cent in first cost over No. 14 copper, but having the same strength as the copper and weighing less than one-half as much, it will support a considerably greater weight of sleet than the copper will.

This difference in weight also means a big saving in the cost of handling the wire.

Copper-clad strand makes ideal messenger wire because a smaller size can be used in copper-clad than in galvanized and no allowance need be made for loss of strength through rust.

For telephone lines up to at least 200 miles No. 9 copper-clad gives perfectly satisfactory talk, costs less than copper, and is very much stronger.

In this connection, the Great Northern Railway System is equipped throughout its entire length with No. 9 copper-clad for telephone train dispatching. This has taken nearly 9,000 miles, or 1,800,000 pounds.

On new routes advantage can be taken of the high tensile strength of copper-clad to reduce the number of poles per mile, and in many cases the saving in poles will go a long way towards paying for the wire.

For river crossings copper-clad has no competition.

Even on copper toll lines, copper-clad tie wires show very large savings.

Harmonic Ringers

Bulletin No. 1016, entitled "Harmonic Selective Systems for Party Lines," has just been issued by the Western Electric Company. The bulletin contains a description in detail of the principle of operation of harmonic systems. A number of diagrams are shown to illustrate the application of harmonic apparatus and the advantages of this system. A wiring diagram shows the extreme simplicity of the harmonic wiring in the switchboard and its advantages over other four-party keys. There are only seven contacts in the Western Electric harmonic key, whereas there are twenty in the ordinary four-party key.

Harmonic party line systems for four-party, eight-party and two-party service are described in detail. A number of pages are devoted to a listing of magneto and central battery wall and desk sets used with the harmonic ringing system, as well as harmonic extension bells and central office ringing apparatus, including the vibrating converter, multi-cycle-motor generator and frequency meters.

It is reported that the Chicago & Northwestern Railroad will replace the telegraphic method of train dispatching with the telephone system between Clinton and Omaha in the near future.

Switzerland Likes American Telephone Methods

In Switzerland, as in other European countries, the telephone is operated under government ownership. Switzerland is one of the best telephoned countries of Europe. The wires that form a network across and around the Swiss Alps are said to carry on an average of sixty million telephone conversations per year.

Geneva's traffic over the wires is now handled in a spacious new building erected on the foundation of the old post office in the Rue de Stand. This structure houses the offices and operating rooms of both telegraph and telephone systems. The operation of Geneva's new telephone exchange, said to be the finest of its kind in Switzerland, is identical with what is considered the best telephone practice in the United States.

Before the installation of the new switchboard the magneto system prevailed in this city. Geneva replaced the old-fashioned methods with a Western Electric central battery system, installed by the Bell Telephone Manufacturing Company of Antwerp. This concern, which is one of the European houses of the Western Electric Company, recently won the Grand Prix at the Brussels exposition with its exhibit of telephone apparatus.

The new board in Geneva, which has a capacity of 12,000 lines, is at present equipped for 7,000 lines. There are 6,300 subscribers, who make an average of 22,000 calls a day, so it can easily be seen that the exchange is one of the busiest.

Operating Room at Geneva, Switzerland.

A view is shown on this page of the subscribers' switchboard, located in a large hall at the end of the new building. Next to this is the toll room, and on the same floor are retiring rooms for the operators, a machine room and offices. The first floor contains rooms for the telegraph apparatus and the offices of the telegraph management. The telephone offices are on the second floor.

The first common battery telephone system in Switzerland was installed in the capital city, Berne, in 1908. The excellent results of this experiment led to the adoption of a similar system at Geneva. The advantages of the lamp signal board have now become apparent to the officials of the Swiss Confederation.

The arrangement of the subscribers' equipment at Geneva may easily be seen from the accompanying illustration. The room containing the local board is about 65 feet in length and half as wide. The ceiling, in the shape of an arch, measures 21 feet above the floor at its highest point. An immense skylight and several large bay windows admit daylight into the room.

Besides ten sections for subscribers' service this part of the exchange contains the following equipment:

A multiple section with 200 subscribers' lines and 17 trunk lines to connect with the sub-stations at d'Anieres, Bellevue, Bernex, Satigny, Vandoeuvres, Vernier, Versoix, etc.

A multiple section for service between the local and toll boards.

A desk for fire service.

A two-postion information and chief operator's desk.

The toll section is installed in an operating room nearly 40 feet long and 15 feet wide, lighted by three large bay windows. It contains a two-position recording section for the toll business from Geneva and a six-position switchboard for toll and long distance service, equipped with 24 lines.

The three-minute time clocks formerly used to measure the length of the conversation have been replaced by clocks which light small lamps each time three minutes of conversation have passed.

The power for the operation of the switchboard is furnished by two storage batteries of 24 volts and with a capacity of 1,500 ampere hours, which are charged by means of two groups of motor generators of 10 h. p. connected to the city mains of Geneva. The alternating current for the ringing machine is furnished by a special motor generator set of four amperes, eighty volts.

The basement contains the cable terminals and lightning arresters and the main distributing frame, with a capacity of 20,000 metallic lines.

Underground cables are led into the basement from the street by the means of conduits and a tunnel.

McMeen and Miller Complete San Francisco

As is well known to the trade, McMeen and Miller, consulting engineers, with offices in the Monadnock building, Chicago, have been telephonically developing the Pacific coast. The work is now completed, and the following communication explains the future plans of the firm:

During the past four years our firm has been engaged upon a specific design, construction and development of independent telephone properties in San Francisco and neighboring California cities.

This work has been conducted for us by Mr. S. G. McMeen, member of our firm. He has devoted almost his entire time to it, largely to the exclusion of attention, on his part, to the service of other of our clients.

Our work on these properties is finished. On April 1, 1911, Mr. McMeen will re-engage in general practice for our clients wherever located.

As heretofore, we shall practice general electrical engineering with special attention to telephony. We shall continue to serve municipalities and governing bodies generally in making appraisements and other investigations of public service.—McMEEN & MILLER.

In connection with this announcement, the personal note concerning Mr. Miller, which will be found on a subsequent page, is interesting.

Western Electric Expects Big Year

The gross business of the Western Electric Company for February was not only 20 per cent larger than the corresponding month in 1910, but constituted a record for February business. On the basis of two months for which reports have been received, gross sales for the year should be about $71,000,000. This would set a new high record in the Western Electric's business, exceeding by $2,000,000 that of 1906.

Western Electric sales for twelve years, if the present year turns out as indicated, will total well over half a billion.

Favorable weather conditions in the west and southwest point to a good demand for telephone equipment from agricultural districts this year. Western Electric is well prepared for the expected enlargement in sales. It has completed all the financing that will be necessary for some time to come and the steady enlargement of the Hawthorne plants will provide the required operating facilities. At present there are 24,000 persons in the company's employ.

Automobiles Useful to Telephone Company

The Southern New England Telephone Company has found automobiles extremely useful in its construction, repair and maintenance departments, and is gradually withdrawing all horse-drawn equippage and substituting motor vehicles. The company has found that a motor vehicle will cover a larger amount of territory at less expense than will horses, and that the efficiency of its men can be more than doubled. Three cars are now doing the work of nine horses.

The American School of Correspondence is mailing literature describing its new Cyclopedia of Telephony and Telegraphy, and offering a special introductory price on the work.

A souvenir in the shape of a little celluloid postage stamp case is given away by the Standard Earth Auger Company, Chicago.

The Valentine-Clark Company has announced that after March 15 its general offices will be located in the Security Bank building, Minneapolis, Minn.

By this move the company will be in closer touch with its operating end and able to give more attention to it. Minneapolis is recognized as the center of the cedar industry, and the company will be able to give personal attention to its Minnesota Transfer Yard, and to handle to better advantage the butt treating plant run in connection with this yard.

The company's operations in Idaho are becoming larger each year. It has been running a western pole yard for a year at St. Maries, Idaho, on the Chicago, Milwaukee & Puget Sound Railway, and will make this point the center of western cedar business.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., is sending out some very interesting folders describing its Mine-a-Phone and No. 896 compact magneto telephone. The Mine-a-Phone circular contains some very good arguments why all mines should be equipped with telephones. The other circular shows how great an advantage the compact type telephone gives in shipment and storage, and displays diagrammatically the good points of the instrument itself.

Another piece of Stromberg-Carlson literature describes that company's Hear-a-Phone, a device for the aid of those hard of hearing, and the Audience-Phone, for use in churches and public halls.

Overwork in close and hot rooms is said to be seriously affecting Vienna, Austria, telephone girls. At the central exchange two young women were seized with fits and thirteen others fell unconscious in the same station within an hour. Four hundred girls work in one large room, where the windows are closed and the ventilation is bad. They get $8 a month at the beginning and rise to a maximum of $20.

Telephones must be installed at all railroad stations in the state of Iowa where there is any sort of telephone service, according to the provisions of the bill introduced in the house by Representative Bauman of Van Buren county. Under the present laws the railroad companies must install telephones only in those towns where telephone exchanges are located.

Platinum has advanced in price to $43 an ounce, the highest figure it has ever reached. In 1905 pure platinum was as low as $18.50 per ounce with only a small demand.

Cards sent out by W. N. Matthews and Brother describe the two-bolt guy clamp and Matthews' guy anchor, and solicit trial orders.

The Indiana Steel and Wire Company has published a booklet telling why its product is so excellent. Every wire-user should read it.

The Equipoise telephone arm is described and illustrated in a return mailing card sent out by the Holtzer-Cabot Electric Company, Chicago.

The Canadian Pacific Railway now dispatches trains by telephone over 2,254 miles of track.

Correspondence

PITTSBURGH, PA., March 15, 1911.

EDITOR TELEPHONE ENGINEER:—Mr. Larson's article and your editorial on the subject of Multiplex Telephony, in the February number, would seem to give Major Squier or the General Electric Company the credit of designing or inventing the high-frequency generator for the production of the current used in Major Squier's system.

I quote from your editorial:

"Not the least interesting part of Major Squier's equipment is the high-frequency generator he uses to deliver his carrying-currents. This machine is remarkable mechanically for its necessarily high speed of rotation. With a rotor a foot in diameter and a speed of twenty thousand revolutions per minute, the enormous peripheral velocity of a thousand feet a second, or twelve miles a minute, is attained. This alone is almost as remarkable as the multiplexing itself."

And, from Mr. Larson's article:

" . . . . he has found preferable a high-frequency generator which was constructed to suit the needs of his system by the General Electric Company."

Knowing something of the history of mechanical high-frequency generation, I wish to call your attention to some of this history.

In Professor Fleming's "Principles of Electric Wave Telegraphy," dated 1906, Professor Fleming, after giving a list of the high-frequency generators which had been built up to that time, this list varying from a 10,000 cycle alternator, output 1,000 w., to a 120,000 cycle alternator, output 0.2 w., says:

"The great defects of all high-frequency generators so far made are their small output and the extremely high speeds at which they have to run. High speeds may be practicable with very small generators, but would be dangerous if the revolving parts were at all heavy. On the whole, the prospect of being able to generate by purely mechanical means high-frequency currents of frequency 100,000 and upwards with large power output is not very great."

In his book published in 1908 on the same subject, he shows several machines, one of them designed by C. G. Brown, with a maximum of 30,000 cycles per second, and still expresses a doubt as to the practicability of making high-frequency generators of large output.

During this period of wireless development work, Mr. Fleming was not alone in his opinion as to the practicability of generation of high-frequency currents by mechanical means, and very few investigators along this line of endeavor considered it worth their while to devote much time to it.

Some time previous to 1903, Professor Reginald A. Fessenden of the National Electric Signaling Company had made a high-frequency generator delivering 10,000 cycles per second, and at that time and since then he has experimented with and developed high-frequency generators, until, at the present time, he has made such alternators up to 100,000 cycles and two or three k. w. output. He is having built at the present time, alternators of larger output, and it seems very likely that he will be as successful in this as he has been in smaller sizes up to two and three k. w.

In 1909 the National Electric Signaling Company sold to the Signal Corps of the U. S. A. a direct-connected high-frequency alternator of the exact type shown in Mr. Larson's article.

Mr. Fessenden has patents pending covering the work he has done on high-frequency generators, and he has described them in many of the technical journals and in his paper before the American Institute of Electrical Engineers at Atlantic City.
—A. STEIN, JR.

Brevities of the Business

PERSONAL NOTES.

Fredric Greer, president of the Harvard Electric Company, Chicago, has been appointed civil service commissioner for Cook county, Illinois. The appointment was made by Peter Bartzen, chairman of the Cook County Board of Supervisors. Mr. Greer has been at the head of his manufacturing business for ten years, growing in that time from desk room in his father's office to a manufacturing space of some twelve hundred square feet. His company's product is well known to the telephone trade and is represented in our advertising pages. Mr. Greer states that he is planning to erect a two-story factory building on the West Side in the very near future to house his rapidly increasing business. Mr. Greer is not a stranger in the political arena, having previously run for secretary of state and for alderman of his home ward in Chicago.

F. W. Pardee, general manager of the Ericsson Manufacturing Co. of Buffalo, who has been spending some time in Florida, is reported to be improving nicely and his friends expect him back on duty in a short time. Mr. Pardee's illness was brought about by overwork, in his efforts to take care of the greatly increased business which his company has enjoyed during the past five or six months, which accounts for this enforced vacation.

H. B. Sanborn, president of the Panhandle Telegraph and Telephone company of Amarillo, Texas, has resigned and will be succeeded by M. C. Lemaster, who has been identified with the company since its organization. Mr. Sanborn will give his time to other business.

C. J. Garlow, Columbus, Neb., has been elected president of the Independent Telephone association of that state, this making Mr. Garlow's fourth term. The other officers are: B. H. Paine, Grand Island, vice-president; L. E. Hurtz, Lincoln, secretary and treasurer.

The City Council of Los Angeles, Cal., has authorized the employment of K. B. Miller of Chicago, to make an appraisment of the property of the Sunset Telephone company, which is endeavoring to enjoin the city from the enforcement of the telephone rates established by the Council last year.

At a meeting of the board of directors of the National Independent Telephone association, recently held in Chicago, Manford Savage of Champaign, Ill., was elected president of the association.

At a recent meeting of the Board of Directors of the American Institute of Electrical Engineers the following associate members were elected: Raymond Vincent Achatz, wire chief, Chicago Telephone Company, Chicago, Ill. Emil Rodolph Albrecht, equipment man, American Telephone and Telegraph Company, Lynchburg, Va. Henry Sampson Brubaker, Draftsman C. D. & Printing Telegraph Company, Pittsburg. Harry Lancaster Burgess, Engineering Department, American Telephone and Telegraph Company, New York, N. Y. Cameron Dewitt Jarvis, assistant engineer, New England Telephone and Telegraph Company, Winthrop, Mass. Arthur White Leet, district manager, Michigan State Telephone Company, Houghton, Mich. Charles Gillespie, electrical engineer, Cumberland Telephone and Telegraph Company, Nashville, Tenn. Albert Stafford, Bay Cities Home Telephone Company, San Francisco, Cal.

P. G. Clement, district manager of the Chicago Telephone company in Batavia the past two years, has resigned to become wire chief of the Wheaton district of the company, which embraces the exchanges at Canal, Lombard, Wheaton, West Chicago and Batavia.

J Carl Swaim has been re-elected general manager of the Home Telephone company, Bloomingdale, Ind. The past year has been the most prosperous in the history of the company.

General Grenville M. Dodge has been elected president of the Independent Telephone company of Council Bluffs, Ia., to succeed F. J. Day, resigned.

H. G. Conger, local manager of the Iowa Telephone company at Iowa Falls, has been made commercial manager of that company with headquarters in Des Moines.

H. L. De Spain, manager of the Protection Telephone company, Protection, Kan., has assumed the management of the

Clark County Telephone company's system with exchanges at Ashland, Englewood, Sitka and Lexington, with headquarters at Ashland.

E. H. Cady, Toledo, O., has been elected president of the Louisville Home Telephone company, Louisville, Ky., to succeed E. M. Coleman, resigned.

Charles H. Hood, secretary-treasurer of the Nebraska Independent Telephone association, has resigned to accept the position of contract agent with the Illinois Tunnel company, of Chicago. Mr. Hood has had twenty years' experience in the telephone work and is an expert in nearly every department of the work. He was formerly connected with the Home Telephone company of Detroit.

E. C. Terry of the American Telephone and Telegraph company, Philadelphia, has been appointed district commercial superintendent of the Third District with headquarters at Pittsburg.

R. S. Chamberlin, superintendent of the local branch of the Consolidated Telephone company at Scranton, has been promoted to the general superintendency of that company with headquarters at Philadelphia. Mr. Chamberlin will be succeeded at Scranton by S. A. McDonough, of that city, who has been in charge of the new business and contract department of the company.

J. V. Hucker, local manager of the Southwestern Telephone and Telegraph company at San Antonio, has been appointed district commercial manager of the company to succeed G. B. Perham, who assumes the district commercial managership of the company with headquarters at Dallas.

Leland Hume, general manager of the Cumberland Telephone and Telegraph company, Nashville, Tenn., was recently tendered a dinner at the Capital City Club, Atlanta, Ga., by J. Epps Brown, vice-president and general manager of the Southern Bell Telephone and Telegraph company of that city.

The election of William P. Sidley, vice-president and general counsel of the Western Electric Company, to the presidency of the Young Men's Christian Association of Chicago was announced at the annual banquet of the managers and committeemen of the general organization held January 18. During Mr. Sidley's term of office the Chicago Y. M. C. A. will be concerned in the administration of a fund of $100,000, which has been donated for the work of establishing association headquarters in the principal cities of foreign non-Christian lands. The Chicago branch of the Y. M. C. A. now leads the country in the strength of its endowments.

G. C. Treadway, for some time manager of the Alton exchange of the Central Union Telephone company, has become commercial agent for the company at Peoria. He will be succeeded by O. M. Burgess of Evansville, Ind.

Fred W. Kelly, until recently superintendent of construction for the InterState Independent Telephone and Telegraph company in Aurora, has been appointed manager for the American Bell Telephone company at Galesburg.

H. K. McKann, who for a long time has so efficiently filed the position of advertising manager of the American Telephone and Telegraph company, has assumed the management of the advertising department of the Standard Oil company.

E. M. Coleman, Louisville, Ky., who conceived and organized the Home Telephone company of that city, has resigned as president of that company and will be succeeded by E. H. Cady of Toledo, Ohio.

George T. Hewes, Des Moines, Ia., has been appointed manager of the Independent Telephone company of Council Bluffs, to succeed C. A. Laubach, who will engage in other business.

Edward P. Clarke, secretary and treasurer of the Great Eastern Telephone company, recently died in New York City, having been stricken only a few hours before with apoplexy. Mr. Clarke was also connected with the El Commercio.

Henry W. Fisher, chief engineer for the Standard Underground Cable Company, of Pittsburg, was recently made a member of the Standard's Committee of the American Institute of Mechanical Engineers.

A. S. R. Smith has been appointed tariff superintendent for the Cleveland Telephone Company, with headquarters at Cleveland, Ohio.

E. A. Woodward has accepted a position in the engineering department of the Chicago Telephone Company. Mr. Woodward was formerly connected with the United States Signal Corps and his extensive experiments in telephony and telegraphy well fit him for his new position.

Frederick R. Parker, chief engineer of the Ericsson Manufacturing Company, is wreathed in ecstacies of joy over the birth of Claudia Frances Parker, who came to the Parker homestead January 7.

A. E. Roome, formerly superintendent of telegraph of the Southern Pacific Company, has been appointed superintendent of telegraph, telephone and signals for the Pacific Electric Railway, with headquarters at Los Angeles.

Mrs. Sarah F. Glass, wife of Louis Glass, vice-president of the Pacific Telephone and Telegraph Company, San Francisco, died on February 3.

Charles Kinyon, recently connected with telegraph interests in Kansas City, has accepted a position with the American Telephone and Telegraph Company at Oklahoma City, Okla.

L. C. Steele, circuit chief of the Michigan State Telephone Company, Detroit, has resigned his position to engage in other work and will be succeeded by D. G. Williams, formerly connected with the American Telephone and Telegraph Company at Indianapolis.

S. A. Jackson, chief test board man for the American Telephone and Telegraph Company at Detroit, has been transferred to Beaver Dam, Ohio, and will be succeeded at Detroit by L. M. Shoppert of Maumee, Ohio.

Thomas D. Lockwood, general patent attorney for the American Telephone and Telegraph Company, Boston, who has been spending some time in Bermuda, has returned much improved in health and will resume his duties with the company April 1.

E. W. Moister, assistant controller of the American Telephone and Telegraph Company at New York, has been transferred to the office of controller and will be succeeded by F. L. Devereaux.

J. C. Kelsey, of the Kellogg Switchboard & Supply Company, who recently returned from a business trip in the southwest, is making a tour of the southern states in the interest of the company.

H. A. Shepard, of the Ericsson Manufacturing Company, Buffalo, N. Y., but formerly connected with TELEPHONE ENGINEER, is the proud father of a brand new baby girl, who made her advent on March 15.

Frank E. Ebersole, so well known in the telephone field, is now connected with the Subway Telephone Construction Company of Chicago in the capacity of assistant to President Joseph Harris, and his work will include construction, installation, contracts, etc.

J. F. Risser, formerly manager of the Putnam Telephone Company, Ottawa, Ohio, has accepted a position as manager of the DesPlaines Telephone Company, DesPlaines, Ill.

CONVENTIONS.

The annual meeting of the Florida Telephone Association will be held in Tallahassee April 23 and 24. In view of the present rapid development of Florida and realizing as they do that the telephone business is an important factor in the development of any community those interested regard this meeting of great importance. An interesting program has been prepared. W. G. Brorein, of Tampa ,is president of the association.

NEW TELEPHONE COMPANIES.

BAY MINETTE, ALA.—The Bay Minette Farmers' Telephone Company has been organized with the following officers: President and manager, E. Edmundson; vice-president, W. H. Byrne; secretary-treasurer, Fred C. Hall. The company will at once install a system.

BLYTHEVILLE, ARK.—Articles of incorporation have been filed with the secretary of state for the Lone Oak Telephone Company.

MARMADUKE, ARK.—The Marmaduke Telephone Company has filed articles of incorporation for the purpose of conducting a general telephone business. The capital stock is $10,000, of which $5,800 is subscribed. The officers of the company are: President, Wilder Carpenter; vice-president, J. S. Simpson; secretary and treasurer, W. E. Lynch.

DAVISBORO, GA.—The Davisboro Telephone Company has been organized with a capital stock of $1,000. The officers of the company are as follows: President, J. W. Aldred; vice-president, W. J. Henderson; secretary, S. E. Hunt; treasurer, S. T. Taylor, Jr.

PLAINS, GA.—Application has been made for a charter for the Plains Telephone Company of Sumner County. The capital stock is $6,000 with privilege of increasing it to $18,000.

VIRDEN, ILL.—The Virden Telephone Company has been incorporated with a capital stock of $25,000 by Chas. H. Snell, Nellie Snell and G. Tucker.

ROCK ISLAND, ILL.—Articles of incorporation have been filed for the Tri City Telephone Company by Benjamin D. Farrar,

J. Hays Britton and S. R. Kenworthy. The capital stock is $1,000 and it is the purpose of the company to do a general telephone and telegraph business.

PULASKI, ILL.—The Pulaski Telephone Company has been incorporated with a capital stock of $2,500 by W. A. Lackey, J. P. Kennedy and James M. Palmer.

MACOMB, ILL.—The Illinois Western Telephone Company, with general offices in this city, has been reorganized under the name of the Western Illinois Telephone Company, with an increase in capital stock from $200,000 to $2,000,000. A trust deed has been filed in Fulton, McDonough, Hancock, Schuyler, Adams and Brown counties, in which the company operates, securing the Western Trust & Savings Bank of Chicago for $2,000,000 5 per cent bonds. The company will at once improve and enlarge its service. It owns and operates about 1,600 miles of toll lines and has over 14,000 telephones in use.

LEXINGTON, ILL.—Articles of incorporation has been filed for the Lexington Telephone Company; capital stock $6,000. The incorporators are J. J. Withers, G. K. Elder and J. L. Vawter.

TOPEKA, ILL.—The Farmers' Telephone Company of Topeka has been incorporated by G. H. Bartel, A. D. Messman and M. N. Smith; capital stock $2,500.

BUSHNELL, ILL.—A charter has been granted the Bardolph & Good Hope Telephone Company. The incorporators are A. W. Colins, W. H. Switzer and Harvey Foster; capital stock $400.

CHESTNUT, ILL.—The Chestnut Mutual Telephone Company has been chartered by the secretary of state. The capital stock is $1,590 and the incorporators are George F. Dittus, W. H. Donnan and F. A. Holtermann.

LENZBURG, ILL.—The Southern Telephone Company has been incorporated by Dan Waeltz, John Vollert and Edmund Baer.

PERRY, ILL.—The Farmers' Telephone Company has been organized with the following officers: President, W. F. Bills, Sandwich; vice-president, W. F. Ahlers, Matthews; secretary-treasurer, Charles Schmalriede, Pinckneyville.

AURORA, IND.—The Holman Telephone Company has been incorporated to construct and operate a telephone system. The incorporators are J. M. Cross, W. W. Rumsey and J. B. Todd, all of Aurora.

MARION, IOWA—The farmers of this vicinity have organized the Marion Farmers' Mutual Telephone Company with the following officers: President, J. D. Robinson; secretary, R. N. Fitzgerald; treasurer, Floyd Sargent; executive committee, G. A. Patscheke, W. H. Roberts, H. L. Jordan, B. O'Connor, Earl Scott, T. J. Graham, J. W. Frazee, A. J. McCreeary, C. F. Nash, Geo. Kramer, Marshall Swain, C. J. Byerly and Chas. Wain.

GENEVA, IND.—The Star Telephone Company has been incorporated by J. Stubett, Charles Duer and W. R. Mann with a capital stock of $1,250.

SAC CITY, IOWA—Articles of incorporation have been filed for the Farmers' Mutual Telephone Company. The new company is capitalized at $5,000 and the incorporators are Fred Pellersels, W. W. Henning, John Hechtner, John G. Brill, George J. Hein, A. F. Mathews, Clarence Purdy, Michael Judd and Ephriam Williams.

DAVENPORT, IOWA—Articles of incorporation have been filed with the recorder of Scott county for the Green Tree Telephone Company which has a capital stock of $1,500. The officers are as follows: President, Ernest Dengler; vice-president, Charles Borchert; secretary, Emil Lamp; treasurer, A. H. Borgelt.

MASON CITY, IOWA, R. R. No. 3—The Owens Grove Telephone Company has been incorporated by A. L. Runyan, Elmer Deach, J. H. Woodward, Evan Jenkins, Rinaldo Richardson, S. S. Stevens.

GUTHRIE CENTER, IOWA—The Guthrie Center & Monteith Telephone Company has been incorporated with W. C. Walters president and A. H. Anderson secretary.

CASSIDAY, KANS.—The Cassiday Mutual Telephone Company has been incorporated with a capital stock of $10,000.

MITCHELL, KANS.—Articles of incorporation have been filed for the Mitchell Mutual Telephone Company; capital stock $10,000.

MCCUE, KANS.—The McCue Telephone Exchange has been incorporated with a capital stock of $1,000.

BYRON, KY.—H. I. Demaree, C. A. Morgan and T. M. Garland have incorporated the Byron Telephone Company with a capital stock of $1,000 to operate a telephone system.

HUSTONVILLE, KY.—W. R. Marksbury and G. T. Mayhew have organized the Hustonville Telephone Company with a capital stock of $1,000.

MACKVILLE, KY.—The Hardin Telephone Company has been incorporated by William Harding, J. D. Sutherland and P. M. Cheatham.

CHEWSVILLE, MD.—The Blue Ridge Telephone Company is the name of a new farmers' company of which Samuel Seneckenberger is superintendent and William Remsberg secretary and treasurer.

BERRIEN SPRINGS, MICH.—The Berrien Springs Telephone Company was recently organized by W. H. Fox and C. E. Garmon.

WILLOW RIVER, MINN.—The Tribune Telephone Company has been incorporated with a capital stock of $25,000. The officers are: President, R. B. Sherrick; vice-president, H. O. Sherrick; secretary and treasurer, J. W. Sherrick; manager, W. R. Sherrick.

WYLIE, MINN.—The Wylie Farmers' Telephone Company has been incorporated with a capital stock of $10,000 by Leon Huot and Fred Gothm of Red Lake Falls and Regis Huot of Wylie.

DONALDSON, MINN.—Articles of incorporation have been filed for the Donaldson-Karlson Farmers' Telephone Company; capital stock $10,000. The incorporators are L. C. Olson, J. N. Sjoholm and others.

LANESBORO, MINN.—A new telephone company of which M. W. Williams is president, T. T. Johnson, vice-president; A. M. Hanson, secretary, and O. M. Hammerstad, treasurer, has been formed to build a new telephone exchange in this city.

LEWISTOWN, MONT.—Articles of incorporation of the Great Divide Telephone Company have been filed with the secretary of state by W. A. Allen, W. P. Kizer and H. James. The company has an authorized capital of $2,500.

MAYWOOD, NEB.—The Farmers' Telephone Company has been incorporated with a capital stock of $5,000.

JERSEY CITY, N. J.—The Telephone Securities Company has been incorporated with a capital stock of $100,000 by H. A. Tufel, R. G. Chace and C. A. Eliott. It is the purpose to deal in stocks, bonds, etc.

SKANEATELES, N. Y.—Articles of incorporation have been filed for the Mottville Telephone Company by John L. Schultz, Skaneateles; Willis J. Moreland, Daniel C. Sheldon, Michael J. Hackett, Flora B. Brown and John W. Brown, Mottville; Thomas W. Powers and James H. Huxford, Skaneateles Falls; capital stock, $3,200.

MILLPORT, N. Y.—The Catherine Valley Telephone Company is the name of a new concern incorporated with a capital stock of $2,000 by Arthur O. Palmer, Emmitt Rhynehart, Ed. Doolittle, Ben McClernan, Joshua Hoxsie, of Montour; Charles W. Sleeper and Simon Fleming, Veteran.

CHINA GROVE, N. C.—The secretary of state has issued a charter to the China Grove Telephone Company, which has been organized by C. J. Young, China Grove; N. White Nenius and Milo A. Kluttz, of Salisbury, with a capital stock of $3,000.

POINDEXTER, N. C.—The Poindexter Telephone Company has been organized by O. J. Martin of Saloam, and others, with a capital stock of $3,200.

MONROE, N. C.—The Monroe Telephone Company has been incorporated with a capital stock of $125,000 by W. H. Belk, Geo. S. Lee and others.

AMBROSE, N. D.—The Divide County Farmers' Telephone Company has been organized with the following directors: T. A. Randall, Peter Tausen and A. Ramsfried.

BROWNSVILLE, OHIO—The Brownsville Farmers' Telephone Company has been incorporated by John A. Mack with a capital stock of $10,000.

MAXVILLE, OHIO—The Maxville Rural Telephone Company was recently organized by Frank Terrel and Scott Kohler.

OKLAHOMA CITY, OKLA.—The Oklahoma Home Telephone Company has been incorporated with a capital stock of $5,000 by C. E. Bishop, R. S. Ross and W. L. Maupin for the purpose of improving the independent service throughout the state.

HYDRO, OKLA.—Articles of incorporation have been filed for the Hydro Telephone Company by D. M. Dill and A. W. Oldham; capital $500.

PEGGS, OKLA.—The Spring Creek Telephone Company has been incorporated with a capital stock of $2,000 by C. W. Bradshaw, C. A. Downing, C. A. Wilson, D. E. Robinson and Tilman England.

KOW, OKLA.—The Beck Prairie Telephone Company has been incorporated by Chas. Howerston, John S. Beck, Frank Potter, Joe Beck, W. D. Beck, Didd Howerton, James Murphy, W. A. Murphy, Harlin Beck and Guy Beck.

BRITTON, OKLA.—Articles of incorporation have been granted the Britton Telephone, Telegraph & Electric Company; capital stock $3,000. The incorporators are G. E. Crawford, S. S. Shintaffer, E. S. Rose, G. W. Riley, W. C. McGrew and W. H. Dye.

PRAIRIE DELL, OKLA.—The Prairie Dell Telephone Company

has been incorporated by Larkin Haynes, Chas. Kirkheart, S. O. Gordon, Mark Reeves, Geo. Kenneck, C. B. Kirkheart, R. S. Carpenter and John Sukdol; capital $800. Postoffice address, Gate.

HARRISBURG, ORE.—Articles of incorporation of the Diamond Hill & Rowland Telephone Company, capital stock $1,000, have been filed with the county clerk. The incorporators are B. F. Pence, W. R. Lane, J. P. Pence and W. M. Moore.

TALATHA, S. C.—The Talatha Telephone Company of Aiken County has been incorporated with a capital stock of $2,000 by W. S. Eubanks, W. G. Hawkinson, S. Johnson and E. P. Dick.

TULARE, S. D.—The Western Farmers' Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are C. B. Hinkley, Chas. Tunbandt and John Fallon of Burdette, Herman Roeber and W. H. Miller, Tulare.

TURTON, S. D.—Articles of incorporation have been filed for the Olean Telephone Company by Jno. A. Huleer and John Steffes of Turton and Thos. A. Hersey of Conde; capital stock $10,000.

JAVA, S. D.—The Java Farmers' Telephone Company is the name of a new concern incorporated by John Bauer, Jacob Staller and Fred Spirey with a capital stock of $10,000.

LIBERTY, TENN.—The Liberty Home Telephone Company has been incorporated by H. M. Evans, N. H. Craddock, T. H. Chapman and W. Percy Whaley; capital stock $3,000.

HENRY, TENN.—Application has been made for a charter for the Henry Telephone Company, organized for the purpose of taking over the old Henry Telephone Company. The officers of the new company are: President, G. G. Baker; vice-president, B. W. Rushing; secretary, J. T. Allen; treasurer, H. C. Burdette; directors, W. D. Hallum, T. F. Blanchett and R. C. Bostic. The stockholders are the county's leading farmers and business men, and the improvements that are to be made will make this system one of the best in the state.

GALLATIN, TENN.—The equipment of the Sumner County Home Telephone Company was recently purchased by parties who have organized the Portland Mutual Telephone Company and will continue to operate the system. The officers are as follows: President, S. H. Roark; vice-president, W. P. Moore; secretary and treasurer, C. W. Kerley.

BRUSH CREEK, TENN.—The Brush Creek Telephone Company has been incorporated with a capital stock of $1,000 by Robert Gwathney, T. H. Nixon, C. A. Bridges, E. W. Jenkins and B. G. Lawrence.

BARRY, TEXAS—The Vest Telephone Company has been incorporated by D. W. Vest, J. W. Denton, A. H. Elmore and others; capital, $20,000.

ALPINE, TEXAS—Articles of incorporation have been filed for the Alpine Telephone Company with a capital stock of $15,000; incorporators, J. E. Mills, W. E. McGaughey and R. T. Burks.

CLAUDEVILLE, VA.—The Three-Fork Telephone Company has been incorporated with a capital stock of $5,000 and the following officers: President, A. T. Jessup; secretary and treasurer, J. A. Barnard; vice-president, W. H. Waller.

WESTFIELD, VT.—Articles of incorporation have been filed by the Missiquo Telephone Company; capital stock, $10,000. The incorporators are W. A. Young, H. W. Burnham and H. D. Miller, Westfield; W. E. Brock and W. D. Miller, Troy.

IRELAND, W. VA.—The Kanawha District Telephone Company has been incorporated by F. B. Emit, P. H. Crawford, O. B. Westfall, of Ireland; Lee Bull, John F. Bull, G. L. Cunningham, of Letch, and J. F. Boseley, of Falls Mills. The authorized capital stock is $10,000.

GILLETTE, WIS.—The Gillette Rural Telephone Company has been incorporated by Frank T. Koske, George Grotchnescher and Gust Bocher; capital stock, $5,000.

PINE RIVER, WIS.—Plans have been perfected for the organization of the Pine River Telephone Company, which will construct a telephone system. G. F. Schulz is promoting the enterprise.

DENMARK, WIS.—The Denmark Farmers' & Merchants' Telephone Company has been incorporated; capital stock, $5,000; incorporators, P. C. Frederickson, Ole Hanson, John F. Enz.

HINTZ, WIS.—The Lazy Brook Telephone Company is the name of a new organization incorporated with a capital stock of $6,000.

BARNEVELD, WIS.—The Trout Creek Telephone Company has been incorporated by Franz Clavolin, D. C. Lewis and Henry Burns with a capital stock of $1,000.

FREISTADT, WIS.—The Ozaukee-Washington Telephone Company has been incorporated with a capital stock of $50,000 by P. W. Kraemer and others.

STANWOOD, MICH.—The Grant and Green Townships Telephone company has been organized with James Hull as president. The company is composed of many prominent farmers, and it is the purpose to supply telephone service to every farmer in the two townships.

BACKUS, MINN.—Articles of incorporation have been filed for the Backus Rural Telephone Company. The capital stock is $10,000, and the incorporators are Laurence Dougherty, J. W. Bailey, O. A. Miller and others.

ST. PAUL, MINN.—Articles of incorporation have been filed with the secretary of state for the Adsit Telephone Manufacturing Company, with a capital stock of $500,000. The officers of the company are: President, G. N. Berrgren; vice-president, G. E. Adsit; secretary and treasurer, Frank Adsit. The new concern will erect factories in St. Paul for the manufacture of telephones and supplies.

MOUNT VERNON, MO.—J. M. Allen, Henry McCanse and others have incorporated the Mount Vernon Telephone Company with a capital stock of $6,000.

BROADVIEW, MONT.—The Treasure State Telephone Company has been incorporated with a capital stock of $25,000 by H. W. Bangert, A. Bouchard and E. B. Kingman.

BLUE HILL, NEB.—The Glenwood Rural Telephone Company has been organized with G. W. Munson, of Bladen, president.

HECLA, NEB.—The North Hecla Telephone Company has been organized with the following officers: President, C. Rovere; treasurer, J. E. Herncall; secretary, A. A. Spradling.

RED CLOUD, NEB.—The East Garfield Telephone Company has been incorporated with a capital stock of $10,000.

ANTHONY, N. M.—The Valley Telephone Company has been incorporated with a capital stock of $50,000.

ELIZABETHTOWN, N. C.—The Bladen Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are John McDonald, R. S. White and J. D. Mercer.

KERNERSVILLE, N. C.—D. A. Smith and others have incorporated the Sedge Garden Telephone Company with a capital stock of $10,000.

EPPING, N. D.—Articles of incorporation have been filed for the Epping Telephone Company with a capital stock of $25,000. The incorporators are Ole Ellington, C. F. Carpenter, Chas. O. Odell, R. L. Hambleton, John Hannegrefs.

GALLIPOLIS, OHIO—The Gallipolis Telephone Company has been incorporated with a capital stock of $50,000 by O. L. Creager, B. Buell, D. H. Morris, C. B. Snyder and C. B. Snyder.

GENEVA, OHIO—Application has been made for a charter for the People's Telephone Company. The capital stock is $10,000. It is the purpose to install a local telephone system.

HOOKER, OKLA.—Articles of incorporation have been filed for the Farmers' Mutual Telephone Company capital stock $1,500. The incorporators are E. D. Hubbard, J. C. Wallace, Cecil Adams, C. C. Adams, F. A. Bateman, William McDowell, Charles Pitts, Thos. Decker and J. S. Wallace.

ADA, OKLA.—The Abbott Telephone Company has been incorporated by Claude Chapman, Fred Blankenship and R. J. Ross, capital stock $1,000.

BYRON, OKLA.—The Byron and Menden Telephone Company has been incorporated by S. C. Razey.

LONE WOLF, OKLA.—Articles of incorporation have been filed for the Lone Wolf Telephone Company by Charles Ilwain, E. Reichart and T. H. Whitesides. The capital stock is $200.

HOBART, OKLA.—The Twin Elk Telephone Company has been incorporated by J. T. Hedrick, D. W. Beaver and E. B. Salisbury. The capital stock is placed at $600.

MONROE, OKLA.—A charter has been granted the Monroe Telephone Company. The capital stock is $1,000 and the directors are C. E. Riggan, J. H. Banning, B. D. Woodson, W. J. Gasaway, W. F. Hunt and E. A. Flynn.

MUSTANG, OKLA.—The Mustang Telephone Company has been incorporated for $1,500 by C. H. Mahr, R. L. Brownlee and others for the purpose of constructing rural lines.

LEMASTERS, PA.—The Peters Township Rural Telephone Company has been organized at this place. President, R. S. McDowell; secretary, T. C. McDowell; treasurer, H. C. McGaughey.

HELLERTOWN, PA.—The Lower Saucon Telephone Company, which is composed of parties living in this vicinity, has been granted a charter by the state department. The capital stock is $5,000. The incorporators are Daniel M. Weber, Howard Mitman, Theodore F. Laubach, treasurer of the corporation; E. J. Schaffer, John B. Boyer, S. C. Riegel, Nathaniel Henn, Titus Weaver, Joseph E. Ruch.

GETTYSBURG, S. D.—The Potter County Telephone Company has been incorporated by T. E. Schofield, Edward Loitwood,

Wm. Carterwright and August Maas, with a capital stock of $50,000.

McINTOSH, S. D.—The South Dakota Independent Telephone Company has been incorporated with a cap tal stock of $80,000 by F. E. Sexton and A. D. Sexton of McIntosh, P. D. Norton, C. E. Thomas and Jacob Louderall of Hettinger.

CLAUDVILLE, VA.—The Three-Fork Telephone Company has been incorporated. The officers are as follows: President, A. T. Jessup; vice-president, W. H. Waller; secretary and treasurer, J. A. Barnard; capital stock; maximum, $5,000; minimum, $500.

ALUM RIDGE, VA.—The Floyd-Montgomery Telephone Company has been incorporated and the following officers elected: President, W. W. Thompson, Sowers, Pa.; vice-president, M. E. Gordon, Copper Valley; secretary and treasurer, R. T. Akers, Alum Ridge. Capital stock; max mum, $10,000; minimum, $1,000.

NEWVILLE, W. VA.—The Newville Telephone Company has been incorporated with an authorized capital stock of $5,000. The incorporators are Benjamin H. Adkinson, Corley; Jesse Skidmore, Newville; A. M. Douglas, Sutton; Jacob M. Harper, Flatwoods; G. W. McQuain, Newville.

CLIFF TOP, W. VA.—Articles of incorporation have been filed for the North Fayette Telephone Company w th a capital stock of $5,000. The incorporators are R. L. Walker, John F. Hugart and R. H. Myles of Cliff Top; N. T. Fox, E. E. Smith and others of Corliss.

CAZENOVIA, WIS.—The Westford Telephone Company has been incorporated. The capital stock is $1,000 and the incorporators are John Keller, Peter Melford, Joseph Duven, F. Rockweller and J. M. Bauer.

RATES.

BATTLE CREEK, MICH.—After April 1 business telephones will be rented for $30 and $36. Previously some subscribers have been paying a higher rate than others and a thorough adjustment will be made. There are 3,400 telephones in service in the city.

OWOSSO, MICH.—The petition for lower rural rates by subscribers of the Union Telephone Company has been referred to W. J. Melchers, general manager, with power to adjust the matter.

LYONS, N. Y.—The Wayne Telephone Company is seeking to increase its rates, which is very much opposed by its patrons. Heretofore the price was $24 for a private line and $21 for a two-party line, while the new prices are $30 for a private line, $27 for a two-party line and $24 for a four-party line. For residences the price will be $24 for a private line, $21 for a two-party and $15 for a four-party line.

EUGENE, ORE.—At a meeting of the users of farmers' telephone lines in Lane county, it was voted to sever connections with the Pacific States Company on account of alleged excessive charges and to establish an independent central station. A committee composed of G. McPherson of Springfield, Ole Holderson and C. E. Swatts of Eugene, was appointed to take charge of the matter.

JOHNSTOWN, PA.—The Johnstown Telephone Company has notified its patrons that beginning April 1 the rate for private line wall set service will be advanced to $30 per annum.

MILTON JUNCTION, WIS.—Farmers in this vicinity are opposed to the proposed raise in rates by the local telephone company and a new company may be formed.

MADISON, WIS.—The railroad commission has granted the Wautoma and Mt. Morris Farmers' Telephone Association the right to increase its rates to $1.50 per month for a single party line, $2.50 for a combination residence and business telephone and $15 per year for rural service.

HOPEDALE, ILL.—The Hopedale Telephone Company recently increased its rates from $1.00 to $1.25 per month.

STAMFORD, KY.—The East Tennessee Telephone Company recently increased its rates in this place from $1.00 to $1.65 for residences and from $2.00 to $2.65 on business houses with the result that practically all of the telephones affected were removed.

BOSTON, MASS.—The Massachusetts Highway Commission has given permission to the New England Telephone and Telegraph Company to add to the schedule of telephone rates now in force, a one and two party, unlimited, full suburban service for residences at annual rates of $45 and $36 respectively.

HARTWELL, NEB.—The Kearney County Telephone Company, operating systems at Norman and Hartwell, has been granted permission to increase subscribers' rates from $1.15 to $1.25 per month.

SCOTTS BLUFF, NEB.—The Platte Valley Telephone Company, having exchanges at Scotts Bluff, Minatare, Mitchell, Gering, Bridgeport and Morrill, has made application for authority to increase its farm line switching rate.

FINANCIAL ITEMS.

MOUNT CARROLL, ILL.—The Mount Carroll Mutual Telephone Company has increased its capital stock from $4,000 to $8,000.

DES PLAINES, ILL.—The capital stock of the Des Plaines Telephone company has been increased from $20,000 to $30,000.

LANARK, ILL.—The Lanark Mutual Telephone Company has increased its capital stock from $10,000 to $12,000.

WESTPOINT, IND.—The Westpoint Co-operative Telephone Company has increased its capital stock from $2,400 to $6,000.

GREENS FORK, IND.—At the annual meeting of the stockholders of the Greens Fork Co-operative Telephone Company it was agreed to increase the capital stock from $4,000 to $5,000.

SAGINAW, MICH.—The Valley Home Telephone Company has been authorized by the Michigan Railroad Commission to make a $150,000 bond issue. The money will be used in making extensions and improvements in the different exchanges.

PORTLAND, MICH.—In order to enable the Portland Telephone Company to meet the demands for rural service, the company will increase its capital stock. There are a number of farmers on the waiting list.

ALBANY, N. Y.—The Farmers' Telephone Company of Madison and Oneida counties has certified to the secretary of state that it has increased its capital stock from $2,000 to $3,500.

MARION, OHIO—The Marion County Telephone Company has filed an amendment to its charter increasing its capital stock from $15,000 to $30,000.

CAMDEN, OHIO—The capital stock of the Camden Telephone Company has been increased from $20,000 to $30,000.

MCCONNELLSVILLE, OHIO.—The capital stock of the Riverdale Telephone Company has been increased from $25,000 to $40,000.

KIRKWOOD, PA.—The Southern Telephone & Telegraph Company has increased its capital stock from $35,000 to $100,000.

BENTLEYVILLE, PA.—The Bentleyville Telephone Company is making arrangements to increase its capital stock and incorporate the company.

ERIE, PA.—The charter of the Mutual Telephone Company has been amended, increasing the capital stock of the company from $150,000 to $500,000.

SABIN, WIS.—The Mill Creek Telephone Company has amended its charter increasing its capital stock from $3,000 to $15,000.

WAUSAU, WIS.—The capital stock of the Marathon County Telephone Company has been increased from $10,000 to $25,000.

SELMA, CAL.—The Fowler Independent Telephone Company has filed an amendment to its charter increasing its capital stock from $7,500 to $30,000.

SWAYZEE, IND.—The Swayzee Co-operative Telephone Company has increased its capital stock to $2,500. W. H. Rybolt is president of the company.

INDIANAPOLIS, IND.—The Rowse Electric Company has filed a report showing increase of capital stock from $60,000 to $70,000, and change of name to Indianapolis Electric Supply Company.

INDIANAPOLIS, IND.—A report has been filed with the secretary of state by the Scott County Telephone Company showing increase of its capital stock from $3,000 to $15,000.

HILLSDALE, MICH.—The Hillsdale County Telephone Company has increased its capital stock from $30,000 to $50,000.

SOUTHBRANCH, MICH.—At the annual meeting of the stock holders of the Iosco County Telephone Company the capital stock of the company was increased from $6,000 to $10,000 to enable the company to make extensions.

NEW BRUNSWICK, N. J.—An amended certificate of the Hudson and Middlesex Telegraph and Telephone Company has been filed with the county clerk increasing the capital stock from $250,000 to $1,000,000.

MCCONNELLSVILLE, OHIO.—The capital stock of the Riverside Telephone Company has been increased from $25,000 to $40,000.

FT. RECOVERY, OHIO.—The Fort Recovery Telephone Company has increased its capital stock from $10,000 to $15,000.

LORAIN, OHIO.—Preparatory to making extensive improvements in its system the Black River Telephone Company has increased its capital stock from $100,000 to $300,000. The present Broadway exchange will be abandoned and a new building erected on a site recently purchased on Ninth street.

WAPWALLOPEN, PA.—The capital stock of the Hollenbeck Telephone Company has been increased from $5,000 to $20,000.

PROVIDENCE, R. I.—The stockholders of the Providence Tele-

phone Company have voted to increase the capital stock from $3,000,000 to $5,000,000.

NEW AUBURN, WIS.—The New Auburn Telephone Company has been increased from $4,000 to $7,000.

WAUTOMA, WIS.—The White River Farmers' Telephone Company has filed an amendment increasing its capital stock from $1,500 to $4,500.

CECIL, WIS.—The capital stock of the Green Valley Toll Line Company has been increased from $2,500 to $15,000.

CONSTRUCTION NEWS.

BIRMINGHAM, ALA.—The People's Home Telephone Company will at once spend $50,000 in improving its system in the Birmingham district, which will include the establishment of a new exchange at Woodlawn and the extension of its service to every suburb of the district. H. H. Stambaugh and A. E. Adams of Youngstown, Ohio, are president and secretary respectively of the company and F. G. McConnell is vice-president and general manager.

BOWLING GREEN, KY.—The Bowling Green Home Telephone Company plans the expenditure of about $10,000 in extending its system.

BARAGA, MICH.—The Baraga County Telephone Company is planning numerous improvements this year, among which will be the rebuilding of the Baraga-L'Anse line.

DENVER, COLO.—The Colorado Telephone Company will construct a five-story addition to its telephone exchange building, Champa street, between Fourteenth and Fifteenth, at a cost of $6,000.

PANA, ILL.—Manager Purcell of the Christian County Telephone Company, announces that the company will shortly install a complete new telephone system in this city which it hopes to have ready for service by May 1st. The new system will have a capacity of 1,500 lines.

MARSHALLTOWN, IOWA.—The Merchants, Mechanics and Farmers' Telephone Company will erect a new exchange building, and install a new system at an expenditure of $100,000.

CEDAR RAPIDS, IOWA.—The Cedar Rapids and Marion Telephone Company contemplates the expenditure of $50,000 in extending and improving its system.

MONTICELLO, IOWA.—The Bell Telephone Company will expend $10,000 in rebuilding its lines in this city during the present season.

WAPELLO, IOWA.—The Iowa Telephone Company which recently purchased the Mississippi Valley Company, is planning the expenditure of a vast amount of money for the improvement of the various exchanges over which it will have control. The sum of $8,000 has been allotted to the exchange in this city, which will include the installation of a new switchboard.

LAFAYETTE, IND.—The directors of the Lafayette Telephone Company have decided to install new telephone equipment for West Lafayette during the present season. When this is done the company will have one of the very best telephone plants in the country, with service second to none.

NEGAUNEE, MICH.—The Marquette County Telephone Company, of Marquette, will improve and extend its service in this place. W. J. Francis has charge of the Negaunee exchange.

LANESBORO, MINN.—At a meeting of farmers and business men held in this city recently it was decided to form an organization with a view to installing a telephone system in this place. The officers of the company are as follows: President, M. W. Williams; vice-president, T. T. Johnson; secretary, A. M. Hanson; treasurer, O. M. Habberstad.

MERIDIAN, MISS.—The Mississippi Home Telephone Company contemplates the expenditure of about $2,500,000 in extending its long distance service to towns in adjacent states. New Orleans, Mobile, Memphis and Shreveport will be the first big points to be connected with the Mississippi lines.

EGG HARBOR CITY, N. J.—The Egg Harbor City Telephone Company contemplates the construction of additional lines for which purpose it has increased its capital stock.

NEW LEIPZIG, N. D.—The Home Telephone Company, recently formed by F. B. Ewald, Jr., and Val Hoerner, both of this place, will install a rural line connecting Birdsall, Burt, Mott and Bentley, also a local system.

MISCELLANEOUS.

HEALDSBURG, CAL.—The Alexander Valley Telephone Company is negotiating for the purchase of the Geyserville exchange of the Pacific Telephone and Telegraph Company. The officers of the company are as follows: President, J. W. Cottle; secretary, E. Moodey; directors, E. D. Cook, J. E. Metzger and George Brown.

ALTON, ILL.—At the annual meeting of the Star Telephone Company the following officers were elected: President, John S. Culp; vice-president, Jas. E. Kelsey; treasurer, D. A. Wyckoff; secretary and general manager, Frank E. Culp. The directors authorized the executive committee to make any improvements that would better the service.

SHELBYVILLE, ILL.—At a meeting of the stockholders of the Mutual Telephone Company the necessary steps were taken to consolidate all the local telephone companies so that from this time there will be but one system in the city. The rates were fixed at $1.60 for business telephones and $1.10 for residence.

MASON CITY, ILL.—The Mason City Telephone and Telegraph Company has grown so rapidly that its facilities have been exhausted and it has been decided to add another section to its switchboard, increasing the capacity.

WALDRON, IND.—The local telephone system has been purchased by J. W. Buckingham of Morristown, who will improve and extend the lines.

BEDFORD, IND.—The deal which has been pending for several months between the American Telephone and Telegraph Company and the Home Telephone Company of Bedford, has been closed, and $25,000 worth of stock held by the latter has been transferred to the new purchasers.

CRAWFORDSVILLE, IND.—An effort is being made to form a third company here, composed of local citizens, that will take over both the Home and the Bell telephone companies and consolidate them.

VINCENNES, IND.—Vincennes will soon have but one telephone system, a deal having been closed whereby the Home company will pass into the hands of the Bell system.

MAQUOKETA, IOWA.—At the annual meeting of the Maquoketa Home Telephone Company the following officers were elected: President, Otto Wettstein, Jr.; vice-president, William Stephens; secretary, C. E. Tilton; manager, Grace Knittle.

MUSCATINE, IOWA.—By the passing of a resolution by the city council the way has been paved for the consolidation of the telephone plant in this city with the Iowa Telephone Company which will be effected as early as possible.

WELLSBURG, IOWA.—The Wellsburg telephone exchange has been purchased by W. T. Neessen.

WATERVILLE, KANS.—The Waterville telephone exchange formerly owned by Hiram Runkle has been purchased by H. P. Vogler for a consideration of $16,000.

ARCADIA, KAN.—The Arcadia telephone system has been purchased by Herbert Rhoades.

LEOTI, KAN.—The Leoti telephone system has been purchased by Dr. J. R. Cary.

BORDEN, KY.—The Home Telephone Company has elected the following officers: President, L. C. Miller; vice-president, H. Hanks; secretary and treasurer, Robert F. True; directors, L. C. Johnson, J. Kruer, B. T. Brown, John Smith, Clarence Coats and Benjamin Schmidt.

IONIA, MICH.—Ionia has two telephone systems and petitions are being signed to do away with one of them, the plan being proposed is to give the Bell company all long distance business and the Citizens' company the local business.

PONTIAC, MICH.—Pontiac now has a single telephone system the lines of the Oakland County Telephone Company having recently been cut over to the Michigan State exchange.

ST. PAUL, MINN.—At its meeting in this city the Minnesota Independent Telephone Association elected the following officers: President, Lucius F. Clark, Bellingham; first vice-president, George Ocobock, Norwood; second vice-president, W. B. Carman, Detroit; secretary, W. S. Clay, Hutchinson; treasurer, P. Furgeson, Mankato.

MORRIS, MINN.—At the annual meeting of the stockholders of the Stevens County Telephone Company the report of General Manager C. B. Randall showed the company to be in excellent condition. After writing off an adequate amount to cover depreciation in the property during the past year, the directors voted a dividend of 5 per cent on the outstanding stock of the corporation.

St. Louis, Mo.—At the annual meeting of the stockholders of the Kinloch Telephone Company the old board of directors were elected as follows: Adolphus Busch, Murray Carlton, Breckenridge Jones, Sam M. Kennard, William J. Lemp, William D. Orthwein, C. Marquand Forster, H. Linton Reber, Henry Nicolaus, William B. Nolker, Philip Stock and Julius S. Walsh.

BOONVILLE, MO.—J. W. Watson has sold his interest in the Boonville Telephone Company to his partner, L. F. Coulter, who will continue to operate the same.